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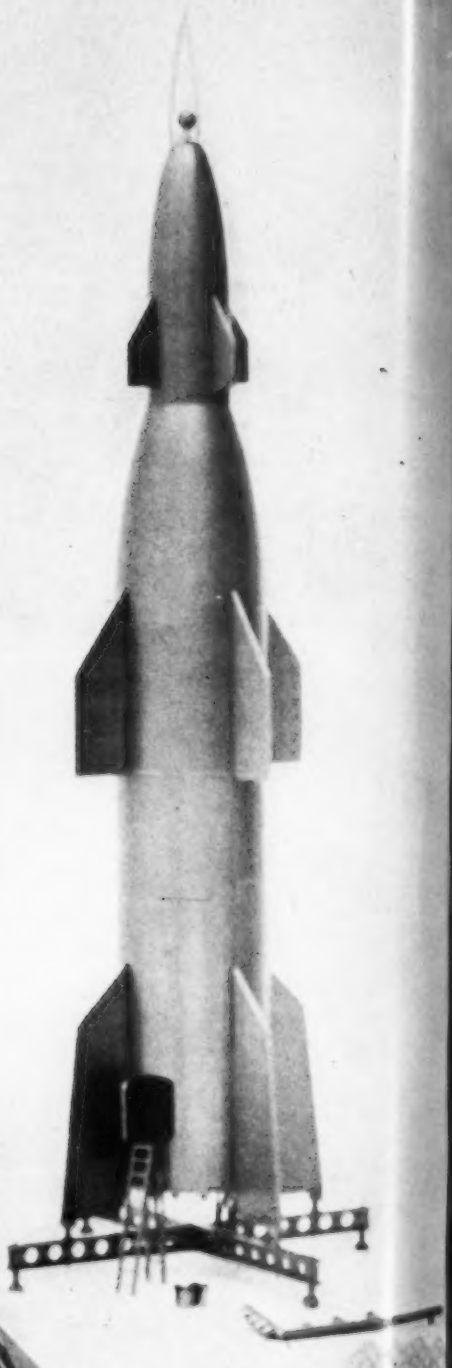

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BUSINESS OFFICE . . . Larry Brettner, Circulation Director; Geneva C. Kinnaird, Circulation Fulfillment Manager; Ellen P. Coakley, Advertising Service Manager.

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PUBLISHING INFORMATION . . . Published: Every other Monday by American Aviation Publications Inc., Washington, D. C. Printed at The Telegraph Press, Harrisburg, Pa. Entered as Second Class Matter in Washington and Harrisburg. **Subscriptions Rates:** For U.S. and Canada—$5.00 for 1 year; $8.00 for 2 years. Other countries—$7.00 for 1 year; $12.00 for 2 years. Subscription limited to aviation industry personnel. **Incorporates:** Airports and Air Carriers: Aviation Equipment; The American Pilot; Aviation Sales & Service; U.S. Aviation; and American Airports. All rights to these names are reserved. **Change of Address:** Send old address (exactly as it appears on mailing label on your copy of magazine) and new address, including zone number if any, to American Aviation, 1001 Vermont Avenue, N.W., Washington 5, D. C. Allow two weeks for changeover.

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MARCH 25, 1957 — VOL. 20, NO. 22

AMERICAN AVIATION

WORLD'S LARGEST AVIATION PUBLISHERS

Money pinch poses new problems for AF

Can B-58 succeed B-52? What about the Navaho missile and the future of the chemical bomber? For analysis see Page 27.

How an airline pilot feels about the 707

Sam Saint, contributing editor to this magazine, gives his impressions of the onset of the jet age starting Page 30.

Eitel-McCullough turns to ceramics for tubes

Here's one manufacturer that is changing over entirely from glass as the answer to future demands on tubes. For story, see Page 41.

Flying night club boosts Cubana traffic

Some skeptics thought the airline was about on the ropes when it turned to new routine, but it's getting out of the red. See Page 57.

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U.S. Marine Corps, p. 10; Canadair, p. 10; U.S. Air Force, p. 27; Boeing, pp. 14, 27, 30; Douglas, p. 28; Sovfoto, p. 33; Sperry, p. 38; Eitel-McCullough, pp. 41, 42; Sabena, p. 55; Cubana, p. 57; Frontier Air Lines, p. 80.

54,500 Copies of This Issue Printed.

Today I flew into tomorrow . . . Why did the airlines plunge into the jet age to the tune of more than a billion dollars? Sam Saint, veteran American Airlines pilot and contributing editor of AMERICAN AVIATION, found the answer when he was aboard the Boeing 707 jet transport from Seattle to Baltimore. In this issue, he gives a vivid description of the flight, his impressions of jet age travel and the answer to the billion-dollar question. See page 30.

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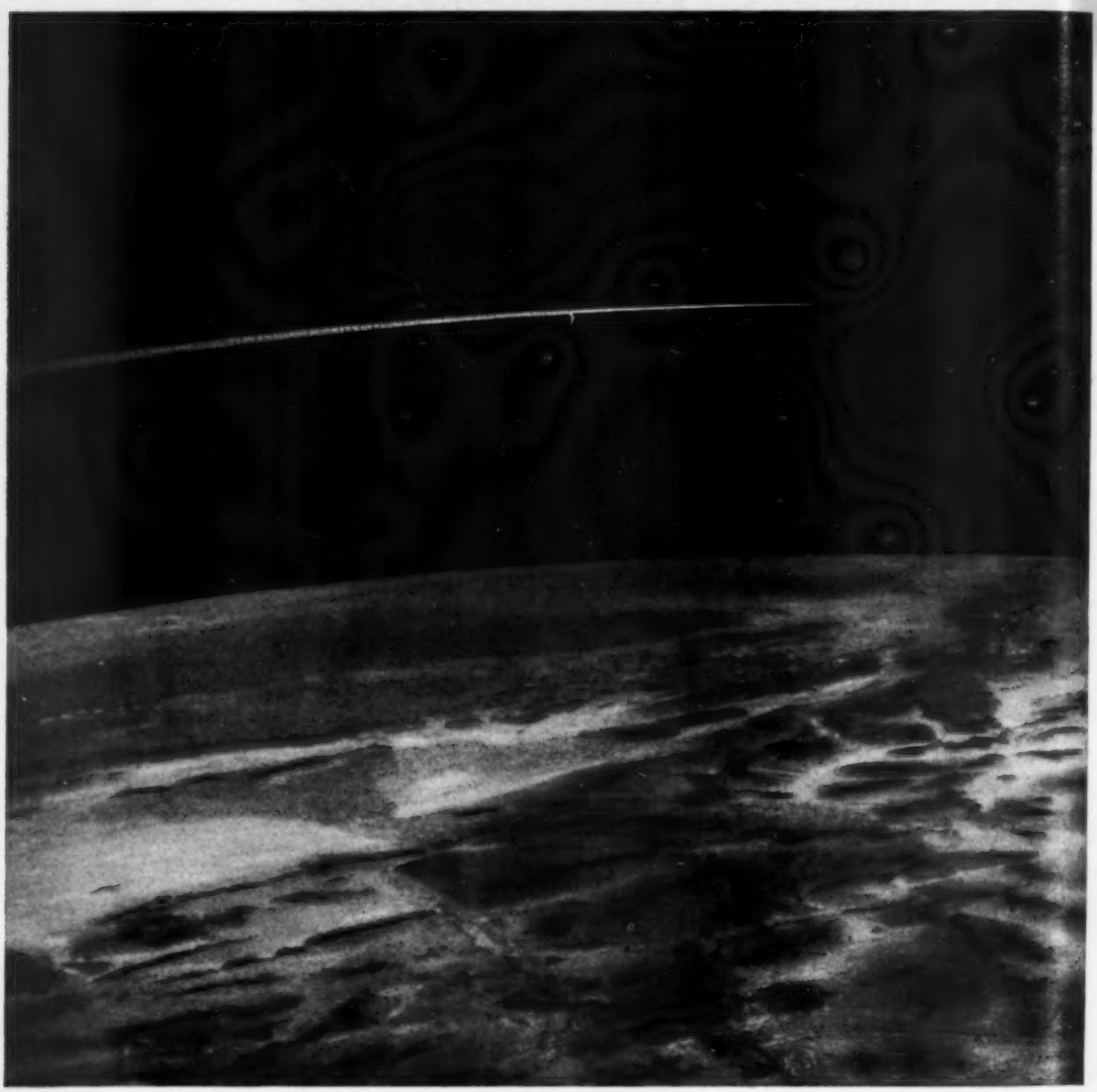

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More on That 'Unfunny' Incident

A CONSIDERABLE RUCKUS was stirred up on this page in the December 17 issue with a small editorial entitled "Unfunny Story."

Said editorial detailed an incident at the Lawrence, Massachusetts airport (uncontrolled) on a Saturday afternoon last September when we were a passenger in a Northeast Airlines DC-3 ready to depart for Manchester. The DC-3 had taxied to the end of the runway and was turning for takeoff when a couple of lightplanes insisted on landing. Capt. Bob Ward had to gun the engines and scoot off the runway onto the turf.

Said editorial had a few sharp things to say about the lightplane pilots, one of whom was making only a touch-down practice landing, and referred to their having violated regulations.

Quite a few readers took us to task in no uncertain terms, pointing out that Section 60.14(e) of the Civil Air Regulations reads: "Aircraft, while on final approach to land, or while landing, have the right-of-way over aircraft in flight or operating on the surface." Okay. By the frame of reference given in the editorial, we concede that readers had legitimate right to take us to task, and for this we offer our apologies.

Report from pilot illuminating

We would have acknowledged the ruckus long before this had we not been awaiting a report on the Lawrence affair from A. A. Lane, vice president-operations for Northeast. As transmitted by Mr. Lane, here are all of the appropriate excerpts from the report filed after the incident by Capt. Ward:

"The first incident occurred on the ground at Lawrence while Flight 770 was taxiing out for takeoff on Runway 5. The wind was 4-6 knots from the east. Runway 5 was being used by local traffic. There were 6 or 7 light aircraft in the pattern when 770 taxied out to the intersection of the N-S runway and Runway 5-23. The ship was run up at this point and waited for several minutes for a break in the landing pattern.

"When the break came, 770 was taxied out to the end of Runway 5 and turned perpendicular to the runway and heading NW. A light craft—identified later as a Cessna (probably a 140), was turning from downwind leg on to base leg. As 770 started to line up for takeoff, the Cessna cut in for the runway too close for 770 to take off. The Cessna came directly over 770.

"Flight 770 was immediately pulled off the runway on to the sod area to get out of the way of the Cessna. Flight 770 was turned to runway heading, then back to runway. A second light ship came around to land, keeping 770 off the runway. A third ship had the courtesy to pull out of a base leg to circle the field. The remaining traffic followed suit. Flight 770 then took off for Manchester. The Cessna had crossed 770 not over 15-20 feet over the top of the DC-3.

"The second incident (which we didn't witness —Ed.) was on Flight 771 returning to LaGuardia from Manchester via Lawrence. In this incident 771 was cut off twice from landing when a light ship cut in front of 771, landed and then remained on the runway with no apparent intention of clearing same but with plenty of time to do so. After second attempt to land had been aborted, 771 requested Lawrence station to call the local service carrier and have them get out of the field and control their students. Third attempt to land was successful."

The above gives a complete picture of an incident which we reported most inadequately. For one thing we had said Capt. Ward was warming up the DC-3 at the hot end of the runway, which wasn't accurate. The second point at issue is when is an airplane on final approach? That is an argument that can go on for a long time but in this instance, from our view as a passenger witness, the lightplane wasn't on final when the DC-3 was preparing for takeoff.

It is worthy of note that whereas the lightplane pilots chose to exercise their technical rights on coming in for landings during the first incident, (if they were on final, which is debatable) the NEA DC-3 had to make three attempts to land on the return flight because of a cut-in by a lightplane and failure of that plane to move off the runway as quickly as possible, if Capt. Ward's report is to be believed.

In any case it seems to us that four items are involved: safety, courtesy, judgment and technical adherence to regulations. The lines of demarcation are not always easy to make out, especially at an uncontrolled airport such as Lawrence.

As far as Northeast is concerned, from what we know, it seems to have done a good and intelligent job of working with local operators at uncontrolled airports in an effort to solve traffic problems in the best interests of all concerned.

Too much haphazard operation

There will be those who insist that every single airplane must be treated identically, using the technical regulations to their nth degree, with each airplane having equal rights. In the older days when all aircraft were pretty much in the same power bracket, this was a splendid democratic idea. But we feel that the day is at hand, if accidents and collisions are to be avoided, when recognition must be taken of the differences as between military, commercial, common carrier and light aircraft. There are assuredly certain conditions which all aircraft must accede to, but there has been far too much haphazard operation of light airplanes ignoring basic concepts of traffic, courtesy and judgment for safety.

Anyway, that's the way we see it. One can debate the matter for hours. We bow in humility to those who pointed out our aberration in regard to Section 60.14 of the CARs, for they were correct insofar as the minimum facts were provided in the editorial. But we suggest a re-reading of Capt. Ward's report, plus some hard thinking on the part of everyone, to the end result that the air is diminishing and the traffic problem increasing. If those Lawrence lightplane pilots were correct to the letter of the regulation, they at least showed little regard for the other factors.

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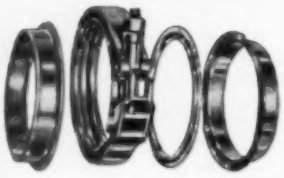

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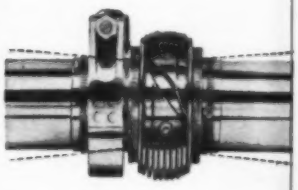

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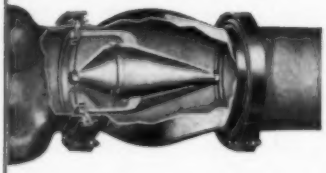

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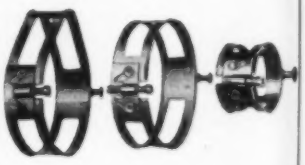

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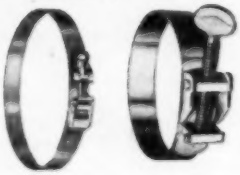

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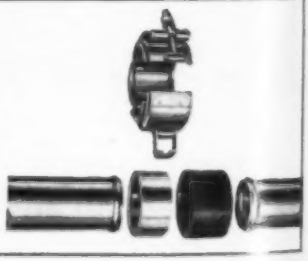

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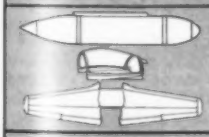	TANK-WING-MAJOR SUBASSEMBLY SUBCONTRACT PRODUCTION
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LETTERS

Objection to interpretation

To the Editor:

The tone of certain portions of the article (Feb. 25, P. 83) about the program the Aeronautical Division of Minneapolis-Honeywell is completing to facilitate employee transfers to our new Florida plant, we believe, could leave an erroneous impression with those not familiar with the program.

Particularly unfortunate was the wording of the headline which implies that the program was a "gimmick" and the wording that over-emphasized the entertainment part of the program and implied that employees had to be flown to Florida and entertained royally before they would agree to a transfer.

Although explained concisely in the opening portion of the article, the crux of our problem was pretty well submerged in the last half-dozen paragraphs. The approximately one-third of employees (and wives) to be transferred who were flown to Florida were to be the "eyes and ears" for the others. We wanted to give employees an on-the-spot look at Florida; sure that once they (or their departmental associates) saw the living and working conditions there would be no hesitancy or lack of enthusiasm. We did not want any employee going to Florida to think he must go "because the company wants me to go."

This company has always been rather conservative and has considered high ethical standards paramount while conducting recruiting or transfer programs. We believe the article may have reflected a different light on our Florida program. And, its tone may have been particularly inappropriate at this time, during the current investigations by the government and military employer recruiting policies. *E. H. SALZMAN, Director of Administration, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.*

Compliment

To the Editor:

Thank you very much for the very fine article that you published in your February 25 issue concerning our new Continuous Fire Detector.

Would you be so kind as to quote us the price and delivery on 1,500 and 5,000 single sheet reprints of this article?— *KENNETH S. BROCK, Advertising & Sales Promotion Mgr., Fenwal Incorporated. Ashland, Mass.*

Liked Canadair story

To the Editor:

I am sure you would like to know that everybody around the company was most gratified at the manner in which the CL-28 was handled (AMERICAN AVIATION Feb. 25, P. 68). The manufacturing people particularly are intensely and justifiably proud of their performance in this regard and they were very happy to see your appreciation of their efforts. *GORDON J. STRINGER, Director of Public Relations, Canadair Ltd. Montreal, Canada.*

Teaching Japanese plastic tooling

To the Editor:

The article "Avro Cuts Costs With Plastic Tooling" in your December 17 issue was of interest to me since I have been training Japanese workers in these and other techniques at the Kawasaki Aircraft Company, Ltd., here in Gifu, Japan, for the past year. . . .

With short make spans for tooling, inexperienced workers, lack of equipment at the beginning, and a very tight schedule, the use of plastics for tool fabrication was indicated. Starting with four workers, two dishpans, several sacks of plaster and a hose to supply water, plus my inability to speak Japanese and theirs to speak English, we started out to make plastic tooling.

The weather was cold with some snow on the ground (28 inches at one time), high humidity and the shop was unheated. Using epoxy tooling resins under these conditions was a new experience to me. We found that materials recommended to cure in 18 to 24 hours at room temperature (70°F) would require from three to four days. Improvised ovens, wooden boxes with electric plates inside, were necessary to accomplish even this fast cure.

The original materials were shipped from the United States. Mr. John Delmonte and Mr. Rex Brookhart of the Furane Plastics Co. were most helpful in supplying literature and advice for our use of their materials in Japan. Mr. J. A. Thomson of Kish Resin Western Sales Division also supplied a very complete brochure on current shop practices in the use of their materials.

Both companies supplied many photographs which proved invaluable under the language barrier. Soon after arriving in Japan, I was introduced to Mr. Zeller, and Mr. Moser of the Ciba Co. of Basel, Switzerland whose offices are in Osaka, Japan. They soon began to supply Ciba materials for plastic tooling to Kawasaki through the Nagase Trading Co., also of Osaka. We have used their epoxy laminating resin exclusively and many of our dies are faced with Araldite type "N" Epoxy.

The Araldite laminating resin is compounded using an amine type hardening agent and it is remarkable to note that very few if any cases of dermatosis have resulted in its use. Perhaps this is due to the darker pigmentation of the Japanese skin. We have installed a blower ventilated plastic mixing and laminating room with running water and hand creams are supplied and the free use of them is encouraged.

We found it necessary to set up rather rigid controls on the quality of the resin as received, and while in use. Epoxys, fillers and hardeners seem to have an affinity for water absorption which is definitely detrimental if 2% by volume is exceeded.

To determine the condition of the materials as received and while in use, periodic inspections, in addition to receiving inspections, were set up, using vials of materials with varying percentages of moisture content so that a comparison check could be visually made of the material at any time.

Liquid epoxy resin turns cloudy in varying degrees due to the absorption of moisture. We found this condition was a constant concern but especially so during the warm months when humidity and temperature were both high. Additional steps were taken to prevent moisture-laden air from entering the container while extracting material for use, by installing an inverted silica-gel container over an intake pipe for the vent.

Due to the fact that our forming dies were stored outside, we did have the problem of pre-heating them before use. This has been accomplished in two ways: One is to place the die in a reinforced wooden box that can be closed, with two or three large electric heating units inside. This will heat an average-sized die in about three hours up to working temperature (about 70°F). The other method is to install immersion type tubular heaters in cored holes in the kirksite, which will accomplish the same results in about the same time.

By the end of June when we return to the United States, an efficient, well-equipped, plastic tooling shop will be well-established here at the Kawasaki Aircraft Co., the first of its kind in Japan. *EARLE WILLIAMS, Tooling Department, Lockheed Aircraft Service-Overseas, Inc. Burbank, Calif.*

Marine Corps Airpower

To the Editor:

With reference to "Marine Corps Modernizes Its Airpower" (AMERICAN AVIATION Feb. 11, p. 29):

At this date, I'm certain that I will not be the first to call attention to the misrepresentation of the FJ-4. However, should you not already have noted, let me hasten to do so.

Instead of misrepresenting the FJ-4 as an obsolete fighter, I really prefer to believe that your error is due to your having been misinformed, misunderstood, or in the final analysis misrepresented. It is, I'm sure, the FJ-2 that you refer to as the older type aircraft to be

replaced. The FJ-4 is altogether another subject. *LT. COL. D. L. CUMMINGS, Commanding Officer, Marine Fighter Squadron 323. El Toro, Calif.*

Editor's note: Marine plans call for replacing slowly, as stated, not only the FJ-4 but the F9F, F2H-4 and F3D with F4D, F8U and other new planes. This is the official Corps statement. Objective is to have an all-supersonic fighter arm. The FJ-4 was not called obsolete, but an "older type" aircraft.

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CANADAIR'S CL-28... ON SCHEDULE!

The first CL-28—the largest aircraft ever built in Canada—rolled off the production lines within hours of a schedule set 2½ years before.

Now completing its rigorous pre-flight test program, Canadair's CL-28 has been designed specifically as an anti-submarine aircraft for search and patrol duties with the RCAF's Maritime Air Command.

Canadair's CL-28—known to the RCAF as the CP-107—is a four-engine, very long range, long endurance sub-hunter and killer. It carries the most comprehensive collection of electronic and other detection equipment ever assembled into one aircraft for locating, tracking, and 'fixing' enemy submarines—whether submerged, 'snorting' or on the surface. Once contact is made, torpedoes, depth bombs, and other offensive weapons are released.

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AIRTRENDS

Water-based weapons systems, both chemical- and nuclear-powered, have been recommended by a committee of aircraft industry officials. Group has just completed eight-month study for Defense Department.

Nuclear power should first be applied to seaplanes, with a water-based prototype used to explore the whole field, committee urges. Adoption of such a policy would change emphasis of present nuclear bomber project under USAF jurisdiction. Group also says long-range chemical or nuclear seaplane bombers would provide mobile, dispersed weapons systems operating independently of fixed bases with unlimited choice of attack routes.

Defense Dept. has asked military services to comment on recommendations, and hopes to decide on policy about June. Adoption of recommendations could result in hot jurisdictional fight between USAF and Navy.

USAF is farming out more and more maintenance and overhaul work. Contractors will handle about 48% of USAF's total man-hour workload for IRAN and modification programs during current fiscal year. In fiscal 1951, they accounted for less than one-fifth of man-hours.

Product-wise, contractors will handle 6,500 of the 8,500 aircraft and 20,000 of the 39,000 engines scheduled for major work this year.

Cost of IRAN and modification has been rising steadily. In 1951, USAF spent $922 million; this year's total will be $1.4 billion. Principal reason for increase is complexity of modern aircraft. A World War II bomber could be renovated for $20,000. Today's expense for a jet bomber is $500,000.

Speed with which aircraft weapons developments have been catching up with basic research is vividly illustrated in testimony of National Advisory Committee for Aeronautics before Congress. NACA officials revealed that new research developments arrived "in the barest nick of time" to be incorporated in such planes as Chance Vought F8U-1 and Convair B-58.

Last-minute NACA contributions to F8U-1, for example, included inlet design, cambered wing, leading edge extensions and inboard ailerons. Fitting these developments to new models required much specific research in NACA facilities, to the detriment of the "pure" research so vitally needed.

There's evidence that industry recognizes the problem. Republic Aviation, for example, has formed a Scientific Research Staff of mathematicians, physicists and other scientists to study problems of flight at several thousand miles an hour and altitude of 50 miles.

Doubts within the Navy over future potential of airships are now dispelled. Recent record-breaking 11-day flight of ZPG-2 blimp, accomplished without refueling, climaxed a three-year study of all-weather capability. Navy is programming present Goodyear blimps and an advanced model for major roles in anti-submarine warfare and for Arctic radar patrol to fill in gaps in the DEW line.

Breakdown of projected 1958 AF plane purchases

Category	Number	Percentage	Flyaway costs (Millions)	Percentage of funds
Bombers	121	8%	$ 999.4	36.4%
Fighters	697	46%	$1,167.0	42.5%
Transports	212	14%	$ 462.1	16.8%
Trainers	485	32%	$ 118.4	4.3%
	1515	100%	$2,746.9	100.0%

Fiscal 1958 USAF aircraft 'buy': 697 fighters, 121 bombers, 212 transports, 485 trainers

Advanced Century series fighters account for almost half the 1,515 new aircraft the Air Force plans to buy in fiscal 1958, according to Dudley C. Sharp, Assistant Secretary of the Air Force for Materiel.

In an exclusive interview with AMERICAN AVIATION, Sharp said 46% of the USAF's fiscal 1958 aircraft "buy" will consist of new fighters. This amounts to 697 aircraft. He did not disclose the types, but it is believed they will consist principally of Convair F-102 and F-106 interceptors and Republic F-105 fighter-bombers.

Bombers will account for 8% of the number of new aircraft to be purchased, or 121 in number. Based on previous statements by Air Force Secretary Donald Quarles, this figure includes 101 Boeing eight-jet B-52 bombers. The remaining 20 aircraft are probably the additional Convair B-58 Hustlers which must be ordered if the second phase of the B-58 flight test program is to be completed. (See story p. 27).

According to Sharp's breakdown, transports will account for 14% of the new aircraft to be bought, while trainers will make up the remaining 32%. The figures work out to 212 transports, principally Lockheed C-130s and Douglas C-133s, and 485 trainers, almost evenly divided between Lockheed T-33s and Cessna T-37s.

The Air Force official said no decision has been made to increase the heavy bomb wings of the Strategic Air Command from 11 to 17 wings and implied that a cutback in the B-52 production rate is likely. "Since the 20 per month rate is consistent with a heavy bomb force in excess of 11 wings," he said, "the Air Force may elect to reduce the 20 per month rate of production."

Sharp warned that the Air Force will discourage companies from building new plants where it appears that all available government and private facilities are not being utilized. "The strong financial position of the industry is such that some companies contemplate building new plants with private funds," he explained. "The Air Force welcomes any demonstration of the free enterprise system; however, we feel that we must exercise a degree of restraint in view of the trend of our programs." He cited the Air Force's recent veto of Boeing's attempt to set up a separate missile division in California as an example of what he has in mind.

Asked whether the factor of industrial dispersal played a role in the Boeing case, Sharp said the availability of other facilities was the paramount consideration and the question of dispersal never arose. The Air Force does not believe dispersal of plants and development facilities should be a major factor in determining their location because "we will fight the war with what we have," he said. He doubted the ability of dispersed assembly plants to deliver equipment in the event of a general nuclear attack, but he emphasized that dispersal of SAC airbases is still a vital element of present USAF policy.

The problem of "over-facilitization" in the aircraft industry has to do primarily with the older, more inefficient private and government-owned plants which would be "impractical" for the manufacture of missiles, he said. Such plants may have to be phased out of the inventory to reduce overhead. But he stressed that *modern* aircraft plants—such as those built of brick rather than wood—can be effectively used in the development and production of new weapons.

Sharp said 10 companies have expressed interest in the Air Force off-the-shelf competition announced last August for twin-jet and four-jet trainer/transports. These are required to replace C-45 and B-25 aircraft, he said.

Since evaluation of hardware proposed by contractors probably will not be completed until the on-set of fiscal 1959, it is impossible to say now whether adequate funds will be provided for procurement of the successful entries.

Sam Saint takes over controls of Boeing 707

SAM SAINT, American Airlines pilot and contributing editor of AMERICAN AVIATION, is shown (left) at controls of the Boeing 707 during its recent cross-country flight from Seattle to Baltimore. Center is A. M. (Tex) Johnston, Boeing chief of flight test and pilot, and J. R. Gannett, copilot. For Saint's comments, see page 30.

Pentagon names Convair winner of design contest for anti-sub flying boat; prepares other decisions

Pentagon was bullish last week on design competitions for new military aircraft. Decisions were made on winners in two contests, one for an anti-submarine flying boat and the other for the high-performance observation aircraft.

A third decision in a contest for a new interceptor was expected momentarily. In addition, Navy was soliciting proposals for a new carrier-based aircraft and was studying entries for a jet VTOL aircraft.

Here are the details:

Convair Division of General Dynamics Corp. won the Navy design competition for a radically advanced anti-submarine warfare flying boat, edging out Grumman Aircraft Engineering Corp. and The Martin Co. The plane reportedly will have a very great range and ability to operate in rougher seas than present flying boats.

Joint Army-Navy competition for a high-performance observation aircraft was locked up, but name of winner will be withheld for about two months. However, it was learned that contest had narrowed down to North American Aviation, Inc. and Grumman. Army-Navy controversy over whether to use the T53 or T58 engine ruled out Beech Aircraft Corp. since its proposal was based on the T53 only. Reasons for withholding winner's name, according to a Navy Bureau of Aeronautics spokesman, was to allow time to notify the losers and to work out design details with the winner.

Recommendation for the company to develop the new Air Force long-range interceptor was on the desk of USAF Secretary Donald Quarles for signature. Authoritative sources revealed North American was "virtually" the winner. Although billed as a new competition, it actually represented salvage of the LRI wiped out last year during a money shortage. At that time, NAA would have been chosen. The "new" competition was based on the old with a compromise on requirements to make the interceptor economically and technically more feasible.

Navy competition for a new carrier-based aircraft was just getting under way with issuance of formal invitations to participate. Although classified, the new design is supposed to carry the Temco Corvus air-to-surface missile now under development. Reportedly, it is to be smaller than the A3J two-place attack plane being developed by North American's Columbus division.

Bell and Ryan were the only two companies participating in the Navy program for a VTOL jet aircraft. Their design proposals are now under study. It is presumed the designs are similar to the prototypes built by the companies for the Air Force—the Ryan X-13 and Bell X-14.

CAB suspends tariffs of seven trunklines

Civil Aeronautics Board has suspended tariffs of seven domestic trunk airlines which proposed to increase passenger fares by 6% on April 1. Board instituted an immediate investigation and ordered hearings to begin April 4.

The new case, expedited because CAB must rule on the tariffs within a statutory 180-day period, is separate from the Board's general fare investigation, which involves all domestic trunks and is expected to run for about two more years.

Carriers involved in the expedited proceeding are Braniff, Capital, Delta, Eastern, Northwest, TWA and United. A CAB majority, in suspending the tariffs, said airline reports "do not indicate any emergency situation which would support permitting the proposed increases to become effective without an investigation and public hearings."

CAA awards certificates to P&W for J57 and J75

CAA has awarded Pratt & Whitney civil type certificates on its J57 and J75 jet engines, powerplants for the Boeing 707 and Douglas DC-8 jet transports.

The approval was the first for the J75, commercially designated JT4A-3, and is covered by Type Certificate No. TC-291. J57 approval (TC-290) is the second and covers P&W's model JT-3C-4. In 1954 CAA approved an earlier version, the Model JT3P.

CAA told AMERICAN AVIATION it now has two additional J57 engine approval projects under way. They cover the JT3C-5 and -6 engines.

Official CAA specification on the P&W jets will contain no specific weight or performance data due to military security restrictions. Overall dimensions for the engines, however, are being released. Length of the J57 is reported as 169 in. and diameter 55 in. J75 measures 191 in. long and 58.5 in. in diameter.

NACA budget request slashed $11 million

The House Appropriations Committee lopped $11,284,000 of the National Advisory Committee for Aeronautics' total 1958 budget request for operations and construction. In the wake of a general economy drive in the House, Congressmen urged NACA officials to "reappraise" their programs and try to cut rising costs themselves.

The committee, however, approved a total $107,000,000 combined request, which represents a $30,323,500 increase over fiscal 1957 appropriations for NACA. Specifically, it axed $5,800,000 from NACA's $76,800,000 request for salaries and expenses and another $5,484,000 from a construction and equipment request of $41,484,000.

The Committee viewed with alarm NACA's rising expenses, which, it said, have tripled since World War II. ". . . Sheer numbers do not add efficiency or necessarily result in research progress," the Committee report observed.

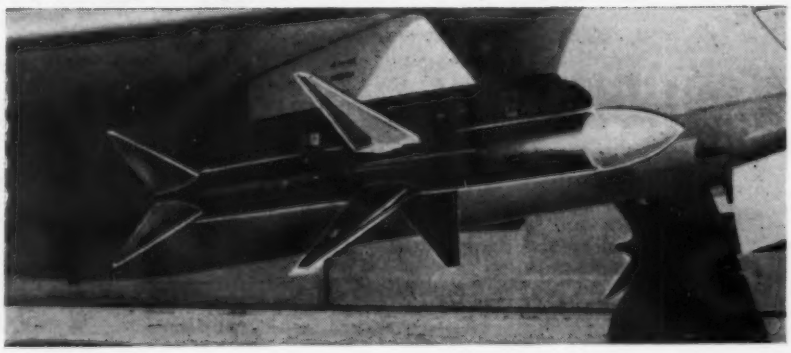
Lockheed building utility jet trainer-transport

Lockheed Aircraft Corp. is building an 8-to-10-passenger jet utility trainer-transport and expects the prototype to fly in September. The aircraft is designed to meet Air Force requirements—cruise at Mach .76, altitude of 45,000.

Meanwhile, North American Aviation has filed application for CAA certification of its six-passenger entry in the military's off-the-shelf competition for the jet trainer-transport. NAA's model cruises at 500 mph at 45,000 ft., has two GE J85 engines, grosses 14,000 lbs., 43 ft. long, 42-ft. span of swept wings. First flight slated for early in 1958.

Navy shows latest version of Sparrow missile

RETOUCHED PHOTO of Navy's new Sparrow III air-to-air missile, developed by Raytheon Mfg. Co. Improvements include more sophisticated guidance.



WASHINGTON TRENDS

Pentagon searches its conscience

Pentagon money-seekers last week found themselves faced with the dilemma of fulfilling a congressional request to cite where $3.5 billion might be safely trimmed from the carefully-nurtured $38.5-billion defense budget.

Secretary Wilson promised House Appropriations Subcommittee Chairman George Mahon (D-Tex.), that by April 1 Defense Dept. would search its conscience and recommend where the budget might be trimmed.

Wilson also was asked what he could do with more money. But economy-minded House leaders were plainly in no mood to give and military brass was alerted to turn in a "sincere" effort to pare the '58 request.

Tentatively, the House group is urging Army and Navy to erase a billion dollars each, AF to lop off $1.5 billion, reductions that undoubtedly would affect force levels.

Military foot-dragging, it appeared from various congressional pronouncements, would light the signal for the House to wield the ax itself. Whether it would slash that deep remained open to speculation as the Pentagon scratched its fiscal head.

Meanwhile, Senate advocates of preparedness were closing ranks to resist the proposed cutbacks.

Slicing the airways pie—a la mode

Special presidential aide Edward Curtis is dishing up a recommended airways system *a la mode*. System will divide airspace into two "modes" of operation, with possibility of a third: (1) all-weather mode; (2) dual-weather mode, and (3) possibly positive separation.

First mode would apply above certain altitudes in dense terminal zones, requiring traffic control at all times and with expansion potential to cover en route altitudes designated by future demands.

Second would operate under regulations similar to those now in effect, but with speed limits and minimum cockpit visibility requirements. Third—set forth only as a possibility—would provide positive separation for pilots without IFR flying ability.

All require airspace reservations, but Curtis said there appears to be space to cover requirements of the next two decades "for all weather and 'see and be seen' altitudes or lanes."

High-handed bilateral diplomacy

Despite State Dept. success in negotiating a bilateral air agreement with Mexico after 11 fruitless years, little harmony exists on this country's unbalanced negotiating team. Civil Aeronautics Board still objects to State's dominant role in the bilateral field and U.S. airlines feel the "diplomats" are too high-handed in their approach.

Most recent dispute came virtually on the eve of bilateral talks scheduled to start with the Dutch in Washington last week. Representatives of the airlines were called before CAB and State officials March 15. CAB Chairman James Durfee told the carriers the Board knew of no reason for granting additional operating authority to KLM Royal Dutch Airlines.

In such cases, CAB is not presumed to have knowledge of affairs of national defense and State and its views are limited to economic features.

But the new Deputy Undersecretary of State for Economic Affairs, C. Douglas Dillon, quickly advised all concerned that State had decided to give the Dutch one of two things sought: a new route to Houston or a polar route to Los Angeles. In short, he told the U.S. carriers to take their pick as to which they would prefer the Dutch to have.

The U.S. airlines then turned to the Senate Commerce Committee for protection. They were seeking a stay of the bilateral talks.

Ironically, it was only two weeks before that talks with Great Britain blew up under somewhat similar conditions.

GAO complains of profit windfalls

New troubles have developed in Congress over aircraft industry profits. General Accounting Office complains that loose regulations are permitting unexpected windfalls and points up the need for tighter control over redeterminable contracts.

A GAO review revealed that some purchasing agents are neglecting to obtain and use proper cost data. Officials think an enforcible clause written into contracts would prevent windfalls—such as the one that increased a manufacturer's intended profit from 10% to 43%.

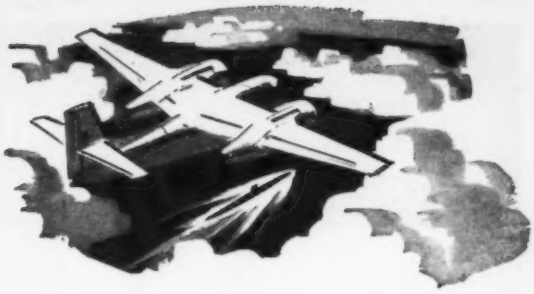
Renegotiation Board also is troubled over contracting. Top Board officials told Congress they are now in the middle of weighing the big aircraft industry contracts of 1953. The lag is greater than the Board likes, officials said, but extended aircraft contracts that run several years create the delay.

A key point of testimony was the Board's belief that 1953 was a "fat" year for the industry, that 1954 may have been as fat.

Radford opens door for Twining

Adm. Arthur Radford has thrown the door wide open for USAF Chief of Staff Gen. Nathan Twining to succeed him as chairman of the Joint Chiefs of Staff next August.

Radford flatly declared he has no intention of seeking a third two-year term, added that rotation of the post is a good idea. Air Force is only service which has not had a turn at the JCS chairmanship.



CYCLONE 9s add to the striking power of Royal Canadian Navy's GRUMMAN CS2F-1

A highly effective sub-hunter, the new De Havilland-built Grumman CS2F-1—serving the Naval Air Branch of the Royal Canadian Navy—is a deadly sub-killer too. Using radar to detect and track subs on the surface, and magnetic airborne detection (MAD) to zero on submerged craft, the CS2F-1 patrols the seas off Canada with an arsenal of torpedoes, depth charges and mines.

Every bit as important as the firepower of this new tracker is its engine power – twin Cyclone 9s by Curtiss-Wright. These modern powerplants, with the longest service background of any aircraft engine type, give the Grumman CS2F-1 its far-reaching overwater capabilities, its hour-after-hour dependability, its fuel economy for maximum patrol endurance and range.

Sub-detection is a vital part of a chain-reaction "offshore patrol" that day and night guards North America, and whose perimeter extends from the Arctic Ocean south around the entire continent. Everywhere in this protective network Curtiss-Wright power plays a leading role.

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SPOTLIGHT

Watch for Frye Corp. to come up with a jet-turboprop version of the F-1 transport. Powerplants probably would be two Rolls-Royce Darts and two General Electric J85s. Idea would be to use jets only during takeoff and climb to cruise altitude where Darts would take over on their own.

PSC Applied Research Ltd. of Toronto has joined forces with Goodyear Tire & Rubber Co. to market its ice detector and control equipment along with Goodyear de-icing systems as a package deal. First success has been registered on Lockheed Electra turboprop transport.

Tail gunner on the Boeing B-52 is about to be moved up front with the rest of the crew, thanks to closed-circuit TV. Arma Division of American Bosch Arma Corp. is well along on a project which would station a TV camera in the tail and allow gunner to operate fire control system by remote control, much as copilot does in B-47. In B-47 the crew has a rear-view through a bubble-type canopy.

De Havilland Gyron jet engine is capable of 30,000 lbs. thrust with afterburner, although official figures still remain at 25,000.

Lockheed has dropped plans to offer the Rolls-Royce Tyne as an alternative powerplant for the turboprop Electra. Instead, customers who do not want the Allison 501 probably will be offered the Napier Eland.

Brazil's REAL airline is first to buy the Napier Eland for re-engining its Convair 340/440 fleet. Order involves about 30 engines.

Temco's new $16-million missile development contract is for a large air-to-surface weapon called Corvus.

Follow-on model for the Chance Vought F8U-1 Crusader will be the F8U-3, using a Pratt & Whitney J75. Present Crusaders are powered by P&W J57s.

Boeing 707 prototype jet transport is slated to undergo a number of engine changes during the next two years. Company plan is to replace two of the four Pratt & Whitney J57s with P&W J75s sometime next year for flight trials in advance of delivery of production 707s that will use the bigger engines. Later, the prototype will be fitted with two Rolls-Royce Conways, probably retaining J75s in the other two pods.

Hydraulic pump supplier for the Convair B-58 Hustler will be United Aircraft Corp.'s Hamilton Standard Division. B-58 will use four H-S pumps, each measuring 9 in. in length, 7½ in. in diameter and delivering 35 gals. per minute to bomber's 3,000 psi hydraulics system. Use of hydraulics in Hustler includes power operation of elevons, rudder, flaps, plus utility functions of raising gear and operating radar.

Continuing influx of larger transports has increased average airline tire costs. One major tire manufacturer figures present-day tire cost averages $162, compared with about $130 two years ago, a 25% increase. Assuming the increase in retread costs is similar that average would go from $33.60 to $42.

Modification of the original XB-52 to carry Pratt & Whitney J75s is under way at Boeing-Wichita. Two J75s will replace four J57s in outboard pods, making it a six-jet B-52. Air Force contract for the project amounts to $1.94 million. AF will use aircraft to accelerate test time on J75.

Next commercial Boeing jet transport to be announced formally will be the 717. It will gross about the same as the 707 prototype (200,000 lbs.), but will have a larger fuselage.

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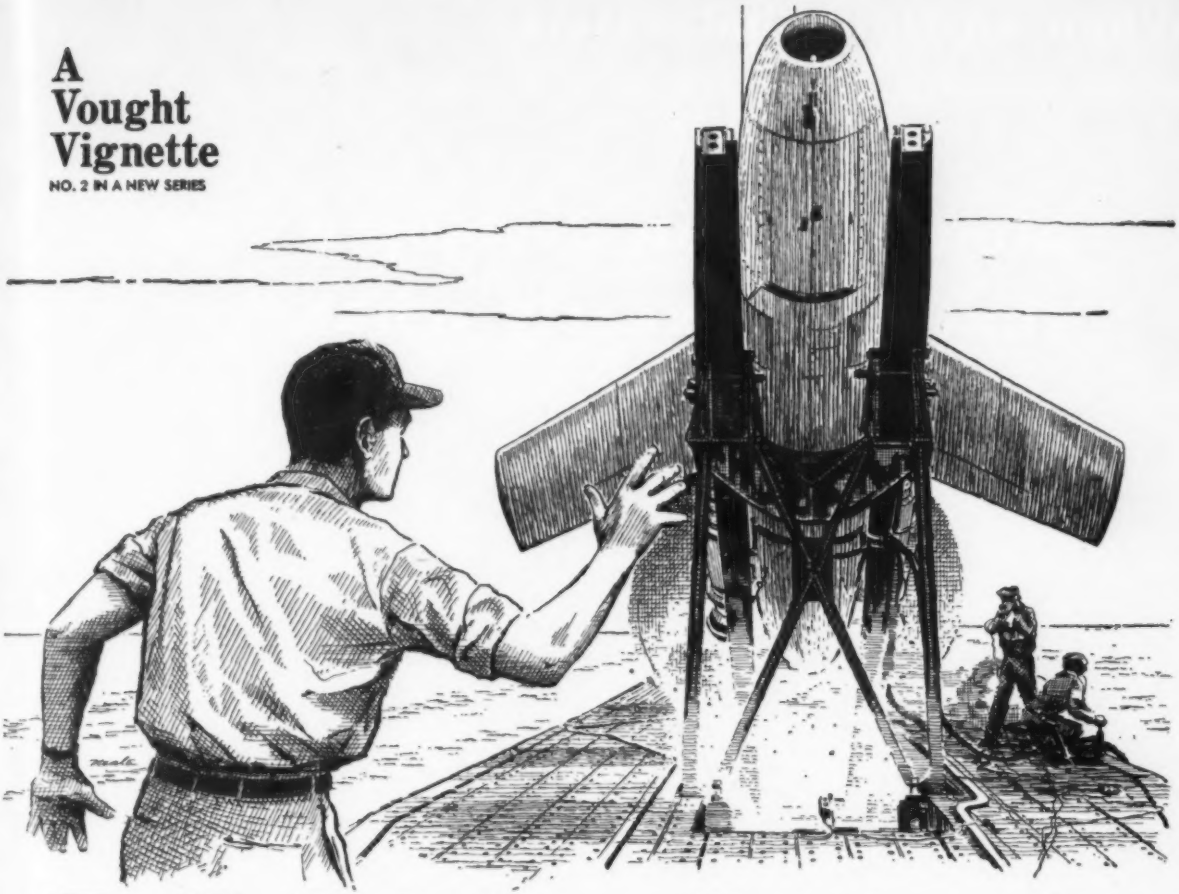

The Missile Engineer with undersea legs

Jack Welch felt honored when he was tossed, fully clothed, into the Navy's sub harbor at Port Hueneme, California. In their own rugged way, submariners were extending him their thanks. He'd been a big help in the introduction of Chance Vought's Regulus I missile to the Navy's Undersea Fleet.

Months before his ceremonial splash, Jack had accompanied the Regulus aboard the submarines *Tunny* and *Barbero* as a representative of Vought's Missile Operations Engineering Group. A veteran of the Regulus flight test program and a collaborator on the conversion of the subs to missile carriers, Jack brought knowledge the Navy welcomed. Likewise, the Navy crews were to share with Jack some equally valuable experience.

Jack, with the submarines *Tunny* and *Barbero*, cruised the East and West Coasts, performed over 200 dives, and once prowled far west of Hawaii. The missile man helped the undersea crews complete initial checkouts of Regulus support equipment — culminating in the first missile launch ever made from a submarine. Then they went about solving environmental and supply problems that arose during tests. Jack added to his mechanical engineering experience a valuable store of electrical, weapon systems and Navy knowledge.

Back in home port, on the *Tunny's* quarter-deck, with a full crew assembled, submarine officers reviewed Jack's contributions. He'd gone beyond his duty as a technical advisor, they concluded. He'd become an expert submariner as well. In fact, he'd qualified for the Silent Service's Gold Dolphin insignia . . . and all hands would proceed at once with the traditional initiation. That's when Jack took his plunge.

Today, Jack divides his time between Chance Vought and a half-dozen Navy shipyards. His job is to see that current missile and ship design is meeting the missile needs of the Fleet. Problems are many, but Jack maintains there's a solution for each. "That's a lesson I learned from the submarine forces," he said. "They gave me a real indoctrination in a can-do attitude under actual operating conditions."

At Chance Vought the missile engineer belongs to a team that already has experienced every conceivable missile problem, from development to operational readiness. Here, current assignments range from theoretical work to the introduction of complete missile systems to the Fleet.

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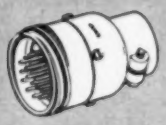

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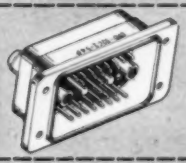

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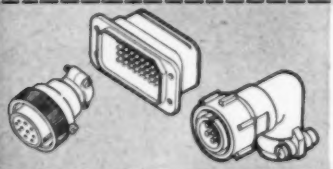

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American Society of Tool Engineers, Silver Anniversary meeting, Shamrock-Hilton Hotel, Houston, Tex., Mar. 25-27.

Western Metal Exposition and Congress, sponsored by American Society for Metals and other technical groups, Pan-Pacific Auditorium and Ambassador Hotel, Los Angeles, Mar. 25-29.

APRIL

SAE Aeronautic Meeting and Production Forum, Hotel Commodore, New York City, Apr. 2-5.

International Society of Aviation Writers Congress, Hotel Roosevelt, Washington, D. C., Apr. 2-6.

American Rocket Society, national annual spring meeting, Sheraton-Park Hotel, Washington, D. C., April 4-6.

ATA Air Traffic Conference annual meeting, St. Charles Hotel, New Orleans, Apr. 10-11.

IRE Professional Group on Telemetry and Remote Control, national symposium, Philadelphia, Apr. 15-17.

Arnold Air Society annual conclave honoring 50 years of military air power, Hotel New Yorker, New York City, April 17-20.

Jet Engine Hydraulics Symposium, sponsored by Vickers, Inc., Hotel Statler, Detroit, Apr. 22-24.

International Airline Navigators Council annual conference, Hotel Piccadilly, New York City, Apr. 23-25.

Airport Operators Council, Conrad Hilton Hotel, Chicago, Apr. 28-May 2.

Flight Test Instrumentation Symposium, Statler Hotel, Los Angeles, Apr. 29-May 2.

Society of Aeronautical Weight Engineers, annual national conference, Broadview Hotel, Wichita, Kas., Apr. 29-May 2.

National Materials Handling Exposition, Convention Hall, Philadelphia, Apr. 29-May 3.

MAY

Aeronautical Training Society, annual meeting, Mayflower Hotel, Washington, D. C., May 2-3.

American Assn. of Airport Executives annual convention, Shamrock-Hilton Hotel, Houston, Tex., May 5-8.

Aero Medical Assn., 28th annual meeting, Shirley Savoy Hotel Denver, May 6-8.

American Helicopter Society, annual forum, Sheraton-Park Hotel, Washington, D. C., May 8-11.

Armed Forces Communications and Electronics Assn., convention, Sheraton-Park Hotel, Washington, May 20-22.

Design Engineering Conference of American Society of Mechanical Engineers, Coliseum, New York City, May 20-23.

International Air Show, Le Bourget Airport, Paris, May 24-June 2.

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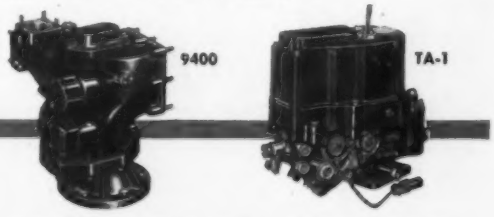

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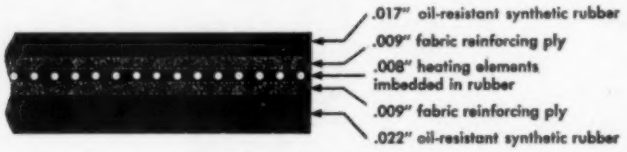
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MARCH 25, 1957—VOL. 20, NO. 22

AMERICAN AVIATION

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Budget Pinch . . .

puts squeeze on Air Force

Decision on Convair B-58 could force cutback in B-52 program; Navaho's fate in question

by Henry T. Simmons and Lois C. Philmus

THE FISCAL 1958 budget pinch is forcing the Air Force to reach a host of crucial, far-reaching policy decisions long before it really wants to make them. Beginning about 60 days from now and culminating with the formation of the fiscal 1959 budget next December, USAF will have to decide these knotty questions:

Can the supersonic Convair B-58 serve in place of the subsonic B-52 on any of its missions, and if so, to what extent?

Will the Navaho intercontinental ramjet missile be dropped entirely, or will unforeseen obstacles in ICBM development justify its production as an operational weapon?

Should the WS-110A manned chemical bomber get a green light for development, and if so, will the WS-125A nuclear bomber be robbed to provide the funds?

Of the three major problems, the B-58/B-52 decision is the most imminent. Publicly, the Air Force maintains it will stick to its program to buy 603 of the eight-jet Boeing bombers, although there may be some reduction in the rate.

Privately, however, some airmen feel the overall B-52 program may be reduced. This would come to pass if the B-58 continues to succeed in its flight test program and USAF feels it advisable to accelerate the project. To finance such a step, money would probably have to be obtained from the fiscal 1958 program to buy the remaining 101 B-52 bombers to round out the Strategic Air Command's heavy bomber force.

To see how the Air Force has gotten itself into this decision-making bind it is necessary to understand some of the budgetary background. When the fiscal 1958 budget was worked up last year, Air Force asked for a rock bottom minimum of more than $900 million in research and development funds to carry out what were considered top priority programs. It wound up with a request for $661 million, or about $250 million less than asked. While it is true development projects are supported in part from procurement accounts, there is no "fat" in that area either.

The unexpected drought in R&D funds produced a sharp squeeze on the entire R&D program. Some drastic actions were necessary to bring it into balance with the new money level. The top priority ballistic missile program, although gobbling up vast amounts of money, had to be left intact. Result was that all the impact was absorbed by lower priority projects.

Specifically, no funds were allocated for the North American Navaho in fiscal 1958. A number of XSM-64 test vehicles were lopped from the program and NAA was told to struggle along as best it could with left-over funds from fiscal 1957 and earlier years in hopes that it can generate enough test data to permit a final determination of the project's fate next fall.

The Martin B-68 advanced tactical bomber was wiped out entirely on the theory that the new Republic F-105 fighter bomber and mid-range ballistic missiles like the Douglas Thor

B-52 (above) or B-58?

can perform its job.

The giant Douglas C-132 is getting the axe on the premise that the same company's C-133, now being built for the Air Force, can lift all but 5% of its loads. And the Republic XF-103 turbo-ramjet fighter is to be "reoriented" along purely experimental lines with a reduction in prototypes on the theory that Russia is nowhere near getting Mach 2 bombers calling for a Mach 3 fighter to intercept them.

Next big Air Force decision will spell out the place of the B-58 in its force structure, and specifically, the relation of that aircraft to the B-52 intercontinental bomber. At the moment, of course, official Air Force policy line is that the B-58 is a replacement for SAC's aging B-47 bombers and that the B-52 bomber program will not be touched as far as total quantity is concerned.

This policy has been emphasized by Secretary Donald Quarles and other high officials. Defense Secretary Charles Wilson disclosed at a press conference last month that the B-58 is considered a successor to the B-52 in some quarters.

Flight tests impressive

Behind the scenes, however, the story is not quite the same. The Convair bomber has been racking up some impressive results during its current flight tests. It has shown more speed than even Convair predicted and the company has launched an aggressive campaign to sell the B-58 to the USAF in place of the B-52 intercontinental bomber. It contends that the B-58 was designed as an intercontinental weapons system from its inception in 1951 and that earlier pessimistic estimates of its performance are unjustified. (Air Force had downgraded B-58 range and radius predictions by 40%.)

There are increasing signs that Air Force officials, particularly in the R&D area, are beginning to listen to these arguments. Even Gen. Curtis LeMay, SAC Commander, is said to be showing more interest in the aircraft. But nobody is thoroughly convinced yet, and the bomber still must surmount a most crucial hurdle before it will be accepted as an "intercontinental" weapon. This has to do with its range. Gen. LeMay, for example, has been prone to regard the B-58 as "short-legged."

Exhaustive tests of the aircraft's drag rise ratio in the higher speed regimes will be conducted during the next several weeks to determine just what can be expected of it. If all goes well, this data will be assembled some time next month.

Should it show that the B-58 has a wide range margin over the B-47, R&D officials may recommend that the B-58 take over a portion of the B-52 mission. If adopted, this would tend to relegate the B-52 to the longer intercontinental missions and the B-58 would be assigned less distant targets.

Douglas in-flight refueling system

BUDDY SYSTEM refueling using Douglas-developed package employing probe and drogue method. A4D Skyhawk flies into position behind AD-6 Skyraider. Fuel transfer can be accomplished in minutes, day or night.

PILOT CHECKS windmill propeller of ram air turbine that supplies power to refueler.

There is no guarantee that Gen. LeMay, Lt. Gen. Frank Everest, Deputy Chief of Staff for Operations and other key USAF officials will go along with such a proposal. For one thing, the B-58 must rely heavily upon in-flight refueling to perform its mission and the men at the operating level have shown a marked inclination in recent years to favor aircraft which require little or no in-flight logistic support.

Furthermore, the B-52 is in production now, while it would probably take at least two years before production models of the B-58 could be expected to roll from Convair's Fort Worth plant.

By mid-1959, most if not all of SAC's 11 wings of B-52 bombers will be operational according to the present timetable. The last of these will incorporate a "wet wing" permitting greater fuel loads and hence greater range.

Yet if room is to be made in the intercontinental striking force for the delta-wing bomber, the program for the longer range B-52 will have to be cut back and the production rate sharply reduced. This step may be a difficult one to take in the face of a Congress which frequently has expressed anxiety over the adequacy of the B-52 program.

But there is still another factor to be considered that does not have to do with the respective merits of the two aircraft. The B-58 test program has two phases. The first, now under way, involves approximately one dozen aircraft for concurrent, simultaneous flight testing. Should the B-58 succeed in the preliminary phase, orders will be placed for additional test machines bringing the total to 31. Funds necessary for these are included in the fiscal 1958 budget and will be so obligated provided there is no disastrous failure in the current program; otherwise the funds will go to the B-52 as Secretary Quarles has said.

In the event the B-58 proves out in present flight tests and the additional

test models are ordered, provision must also be made to tool up Convair for quantity production of the supersonic bomber. Although no quantity orders would be placed for the aircraft until fiscal 1959 funds become available, pre-production work would have to start sometime in fiscal 1958 to avoid a gap between the last test models and first production items. To finance this work, the B-52 project may have to be robbed.

To what extent these factors are related and their eventual impact on the Air Force's fiscal 1958 procurement program must remain to be seen, but it has certainly become increasingly clear that the B-52 is not immune to a "reorientation." While it could profit from an all-out failure of the B-58, it could also lose if the B-58 succeeds beyond the Air Force's expectations.

By the time Air Force has worked out the B-58/B-52 problem, it will be facing a brand new bunch of problems dealing with "next generation" weapons such as the Navaho missile, the WS-110A manned bomber, the nuclear bomber, and the ballistic missiles.

Take the case of the Navaho. Although there is no money for it in fiscal 1958, the project still has a precarious lease on life. With a little luck, North American may be able to demonstrate the fundamental soundness of its concept with the small number of test vehicles remaining in its program. Should it succeed in this by next fall, and should the Atlas-Titan-Thor development program encounter obstacles which threaten a major setback, a decision will have to be made on whether to resuscitate the Navaho or let it die.

Navaho's fate in question

The principal question to be answered in reaching such a decision is the length of time the Navaho could be expected to be operational before the ICBM is perfected and turned over to SAC.

If this period is on the order of two or three years, USAF will probably drop the Navaho and order increased number of Northrop turbojet-powered Snark intercontinental missiles. But if the period looks like it will stretch to five years or more, Navaho stands a much better chance. In the latter case, money could probably be drawn from certain phases of the ICBM program and put on the Navaho without affecting basic ICBM progress.

There are other considerations which might work against the Navaho. It is no less subject to guidance problems than the ICBM, for example, and the Air Force may prefer to turn in an entirely different direction, i.e., to the manned chemical bomber. Although this weapons may not have the glamour of the big missiles, no trouble is expected from it as far as guidance is concerned.

Boeing and North American are expected to complete their new proposals on the WS-110A about June, but probably will not be evaluated for several months. (The Air Force rejected the two companies' initial proposals last fall because of their huge size and called for new proposals no larger and, if possible, smaller than the B-52.)

If the ICBM program continues in good health through next summer, the Navaho will most likely get the axe, but the question of the WS-110A will still have to be answered. No matter how well the ICBM performs in its initial tests, Air Force is not inclined to break away from the manned bomber concept so soon.

Here's how one official puts it: "I see two broad phases in ballistic missile operation. In the first phase, we can offer a reasonable guarantee that we would miss Western Europe and hit Russia. In the second, we should be able to drop them in the vicinity of the targets. The trouble is, I don't know how long that first phase will last."

Should a decision be reached to go ahead with the manned bomber, the old problem of finding the money will loom up again. Assuming a continuation of the tight ceiling on R&D funds and continued top-speed development of the ballistic weapons, Air Force will have to find some other project to "rob" for the necessary funds.

Unfortunately, there aren't many more big projects to rob. The only really big one that comes to mind is the WS-125A nuclear bomber on which Lockheed and Convair are working, but that was "reoriented" just last fall with subsequent howls from Congress and it isn't clear how much more "reorienting" it can take.

Congressional committee studies proposal to name Pentagon information 'czar'

Congress is weighing a Pentagon proposal to establish an information "czar" to peel the secrecy label from confidential documents. The suggestion was being considered by the House Government Information Subcommittee as its chairman Rep. John E. Moss (D-Calif.) concluded a two-day probe of Pentagon information policies.

Hearings commenced with testimony by Charles A. Coolidge, a Boston lawyer and former Assistant Defense Secretary whose committee made a study of Defense Department information rules last year.

One of his most startling revelations before the Moss group was the fact that military men are classifying more information today than they did during World War II, when six billion documents were stamped secret.

Coolidge, who headed a survey committee of four retired officers, defended one of its recommendations that Chairman Moss had termed "shocking." It was the suggestion that newsmen be called before grand juries to disclose the source of any security "leak."

Coolidge explained the action should be limited to the most serious breaches of security—or the disclosure of "top secret data." As far as he knew no recent leak was serious enough to merit use of the proposed rule.

The problem of declassifying information once it receives a stamp troubled Rep. Moss. Coolidge agreed it was far too easy to classify and much too hard to remove the label once it is fixed on a document.

If one man were assigned to the declassification task, House investigators said, they wanted to be apprised of his duties—to learn whether he would end up as a "fall guy" for complaints about Pentagon information policies.

Adm. William M. Fechteler, a committee member, voiced a blunt proposal to rid the military of a vast backlog of classified wartime documents occupying 3 million linear feet: "The best cure for this is a big bonfire," said the former Chief of Naval Operations.

"We write too many papers, period," he said ". . . It's a state of mind."

The Subcommittee said a report on the controversy should be ready about mid-April, and action on some phases of the report is expected before the end of the year.

AF to curtail Republic's XF-103 program

Republic Aviation's XF-103 turbojet-ramjet interceptor program will be curtailed, according to informal notification by the Air Force.

Indications are that the original order for three prototypes will be cut to one. However, the schedule calling for first flight of the model in late 1958 is expected to hold. Apparently there are no fiscal 1958 funds to support the full program.

Navy drops plans to buy twin-jet utility plane

Navy plans to buy an off-the-shelf twin-jet utility aircraft have been shelved because of a lack of funds in fiscal 1958 budget.

Last June the Navy had informally solicited proposals in an off-the-shelf competition and six proposals were received from three companies. Navy is also interested in a multi-jet utility aircraft but is just watching private developments for the time being.

An airline pilot flies into tomorrow

AA captain has 'stardust in eyes' after 707 flight

by Sam Saint

YESTERDAY I flew west in a plush, lumbering Stratocruiser, once the pride of the fleet but now 11 hours of vibration from New York to Seattle. As 112 old-fashioned pistons pounded up and down and the four big props flailed the air hour after weary hour, I wondered what it would be like to ride the big Boeing jet airliner—the 707—back east the next day.

I found myself pondering a question long in my mind: What sort of insanity had caused the airlines of the world suddenly to drop all vestiges of caution and go plunging headlong into the jet era? With unanswered questions to the right of them and unsolved problems to the left of them, the airlines are gambling billions on these kerosene-burning monsters of the future. Why?

Today I had the answer. As I rolled out of bed in the predawn darkness in Seattle and gathered with some 30 other reporters for the bus ride to the Boeing factory field, I tried not to show the growing excitement I felt.

The bus rolled through the factory gates in the first grey light of dawn. Moving between rows of great jet bombers, under low, scudding clouds, we rounded the corner of a gaunt building and there it was—obviously commercial because of its brown and orange paint.

Somehow it did not seem as big as the 131-passenger figure in the brochure (162 for aircoach seating) had led me to believe. Where within this sleek hull, and slender swept-back wing could a total gross weight of 100 tons be packed away? With slightly larger fuselage and J75 engines, the intercontinental version of the 707 will taxi away from the gate with 148 tons distributed on its 10 giant tires.

The simplicity of design and the clean, uncomplicated lines of this prototype of tomorrow's fleet belied the $16 million it cost to design and build. And where could the power of diesel locomotives be packed in each of those four small engine pods hanging under the wing? A total of 40,000 horsepower! Incredible!

We climbed the loading ramp and entered the airplane through a huge cargo-type door. Thirty-two writers and photographers, 16 Boeing pilots, engineers and sales representatives and three airline stewardesses in uniforms of American, TWA and Braniff all milled in confusion on the flight deck and in the three compartments of the long cabin. I recognized A. M. (Tex) Johnston, chief of flight test for Boeing, the pilot who would fly us east.

Kibitzing over the shoulders of two flight engineers, I learned that we would gross 191,581 pounds at takeoff —*after burning a thousand pounds of fuel to taxi out!* Never mind. We had plenty of go-juice: 12,597 gallons weighing more than 40 tons to be exact.

Then, seat belts. Inside the cabin with all the doors closed I was hardly aware that engines had been started—excuse me, I mean, "lighted." It was 7:03 a. m. Pacific Standard Time. We rolled a short distance and stopped for a few seconds, and then—at first I couldn't believe it—we were already in the takeoff roll.

The engine noise rose to become a rushing of mighty wind. Acceleration seemed slow, but the wheels were off before I expected. The time: 7:06 p.s.t. I was suddenly aware that the noise of the engines was moving aft and dying out as though we were flying off and leaving our engines behind. The cabin floor tilted up and you could feel we were still accelerating.

Tex announced over the PA system that we were free to get up and move around. By the time I got forward, others were about four deep behind the pilots on the spacious flight deck. At the aft end of the flight deck I found an engineer with a bank of automatic recording cameras aimed into a box-like enclosure. One side was open and I saw inside a brightly lighted panel with duplicates of all the usual instruments and many that were new to me.

I sat on my haunches and studied the instruments, taking notes. Airspeed was steady at 300 knots (indicated). The altimeters were turning like living things at a steady 2,200 feet per minute climb. Those veeder counters clicking away at the bottom of the panel were ticking off gallons of fuel. ABOUT 40 GALLONS PER MINUTE were flowing into the four engines to blast out the tailpipes in a fury of power.

Dominating all other impressions was the smooth sense of power in this hurtling uphill flight. No vibration. I moved forward to sit on the low jump seat behind Tex Johnston's shoulder; the promise of coffee had thinned out the crowd up front. As I gazed at the opaque world outside, the grey turned brighter and we burst out of the top of the highest cloud layer into the clear blue of the upper air. The big ship was steady as a rock.

Then it hit me—right between the eyes. I knew why the airlines of the world have made such a tremendous gamble. This was right—the way flying ought to be: smooth, solid, quiet and with obvious power to throw away. Everything about this giant machine built confidence. It was the most exciting moment of my 28 years as a pilot.

Who cares about problems?

Problems? Air traffic control? Runways? Noise? (On the ground, that is.) Sure, there are problems. We'll get around to them, but say, have you seen the figures on the first segment of the trip?

We were over Spokane at 07:30 pst, just 24 minutes after the wheels left the runway at Seattle. We had averaged 547 miles per hour over the ground while climbing to 31,000 feet! The sky overhead had the first beginning of the purple cast seen at very high altitudes. Without ground reference, we seemed to hang motionless in space. In the cockpit, the engines were almost unheard, only a dry hiss on the outside skin spoke of the 596 mph we were making through the thin upper air.

A slight jolting for a few minutes made the crew think we had found the jet stream. Sure enough, the next check

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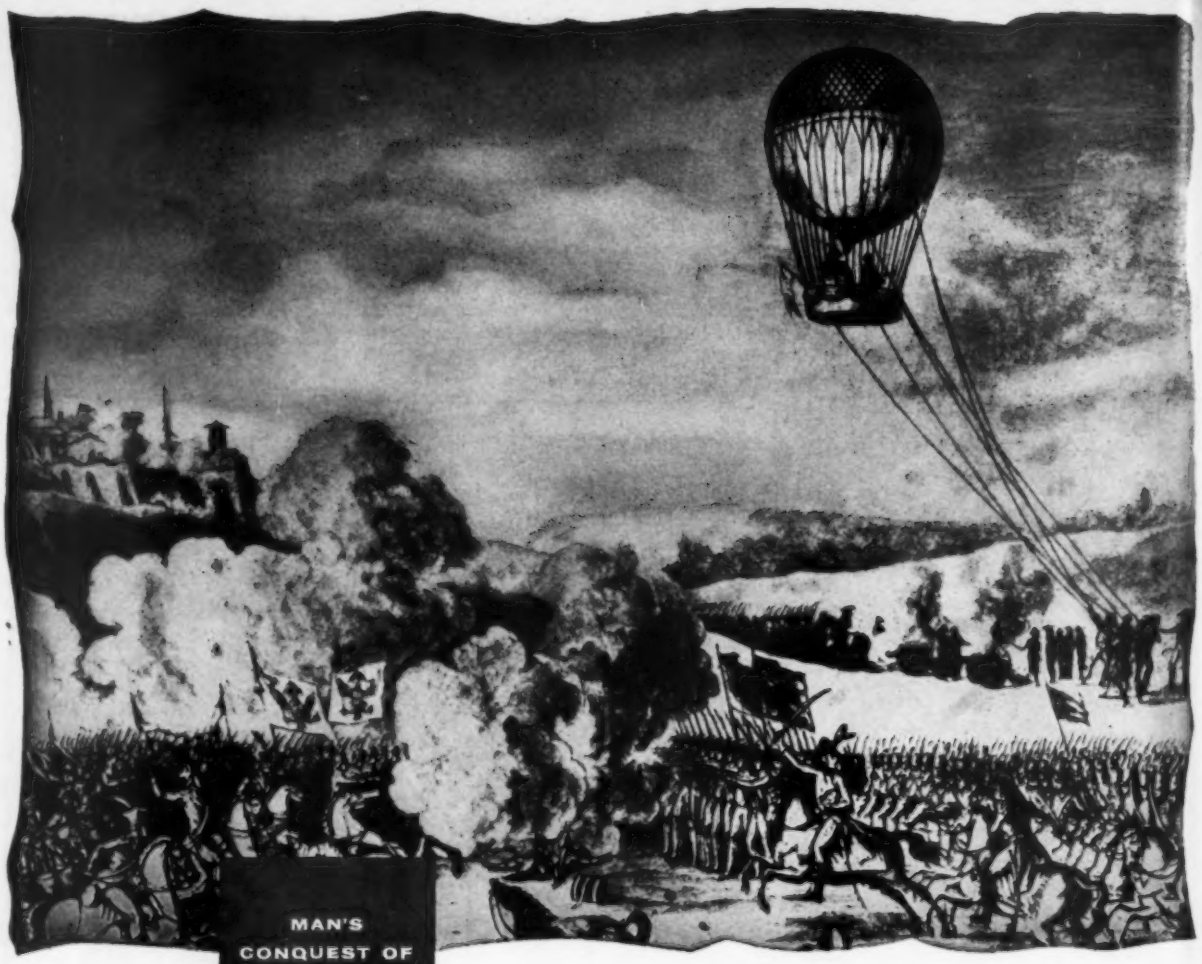

MAN'S CONQUEST OF THE AIR

First aerial observation of battle

Undoubtedly an important factor in the victory of French forces at the Battle of Fleurus in Belgium in 1794 was, believe it or not, aerial reconnaissance. For in this battle Captain J.M.J. Coutelle—later known as "Captain of Napoleon's Aerostiers"—became the world's first military balloon observer. For hours Coutelle's balloon hovered over "no man's land" and even over the enemy's lines. With signal flags he and a companion relayed vital information back to the French Army Commander.

Coutelle continued his aerial reconnaissance for Napoleon at Mayence in 1796 and elsewhere. But in Egypt, where he had been ordered in 1798, his balloon equipment was finally destroyed in a naval battle. Man's conquest of the air has come a long way from the uncontrollable balloons of yesterday to the sleek, earth-circling giants of today. Since the advent of powered flight, Esso research has helped speed the progress of aviation by creating new and improved fuels and lubricants for military and commercial aircraft.

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AVIATION PRODUCTS

point revealed our ground speed had jumped to 698 mph!

I tried to sit still—to think quietly. I couldn't. I returned to the main cabin and stood in a confusion of breakfast trays, cameras and typewriters pounding out such words as "incredible" and "ripping through space." The navigator was posting our position in grease pencil on a large map on the forward bulkhead. He had to continue posing for innumerable pictures.

In the midst of all this, my mind went back to flying school days and the instructor who confidently explained that there was a fundamental limitation to the size of an airplane. The Trimotor Ford (gross weight 13,250 lbs.), he assured us, was probably the largest flying machine that would ever be practical. *I wondered what we would think of the Boeing 707 looking back from 28 years hence.*

We went to 35,000 ft. to get out of turbulent air.

Shock waves visible

Someone said, "Look at the shock wave over the wing!" I thought shock waves were something photographed in supersonic windtunnels with some sort of trickery to make it visible; but there it was, a writhing, shadowy line angling back along the wing as we boiled along at Mach 0.86 (86% of the speed of sound).

Word was passed that we had lost the jet stream. Ground speed had fallen to a mere 600 mph. I thought it good that Tex was flying this trip using standard airline techniques and normal cruise power settings. There was no straining for a record, but there was, nevertheless, much speculation about arrival time.

Would we better the time of an F84F that flew from Los Angeles to New York (101 miles shorter) in 3 hours and 45 minutes about a year and a half ago? Or the time of a B-47 that flew from March Field, Calif., to Bedford, Mass., in 3 hours and 47 minutes? Or the previous flight of the 707 from Seattle to Andrews AFB, Washington, D. C., in 3 hours and 58 minutes?

We were over Milwaukee. The press crowd began to realize this trip would soon be over. They stepped up the tempo of their questioning. Photographers got busy looking for angles, taking pictures of coins balanced on edge, a movie camera rolling on a close-up of a cup of coffee sitting on the arm of a seat.

We passed Toledo at 29,000 ft., having descended *because of traffic* in a Defense Zone. A few minutes later we were abeam Cleveland heading for Wheeling, W. Va.

Clouds and stormy weather over Ohio broke away and we flashed across the Baltimore omni at 25,000 ft., *just 3 hours and 48 minutes from takeoff!*

As we crossed the omni, I was again crouched where I could see the recording instruments. Tex announced: "Over the omni at :54." I saw instruments spin as power was pulled off. The deceleration was sharply noticeable as speed brakes went out. As the altimeters began to unwind at nearly 10,000 feet per minute, I decided passengers would not mind this sort of thing. As they get educated to this new mode of flight, they'll be glad to know that the man in the front left seat has such complete control of this hurtling monster.

I stayed by the instruments as we bent around the field on final. We crossed the boundary at 119 knots and touched down at 110 knots (speeds identical with the DC-7). Our weight on landing: 125,000 pounds—about 33 tons of fuel lighter than when we started. The tower advised Tex that the third taxi turn-off was available for his use. Tex used power to reach the *first* turn-off! And that was the trip. We had averaged 612 mph over the 2,325-mile course. We had landed with 4,500 gallons of fuel still aboard.

Problems? Boss, I know you asked me to report on problems of the jet age. And there are some whoppers. But they'll have to wait for another issue. I need time to get the stardust out of my eyes.

Three top Russian aircraft designers

BOMBER VERSION of "Super Flashlight" unveiled at last year's Moscow air show appears in model form on the desk of its designer Alexander Yakovlev. There is also an all-weather fighter version of this aircraft.

OFFICIAL RUSSIAN PHOTO of cockpit of a new "Many-seater" passenger aircraft indicates that Serge Vladimirovich Ilyushin's four-turboprop transport will soon fly. Ilyushin is on left. In right-hand seat is fighter designer Artem Ivanovich Mikoyan.

AF defends its dealings with small business

by Charles Schaeffer

SMALL BUSINESS last week was singing the procurement blues to an Air Force audience on Capitol Hill. The refrain was Air Force's weapons system concept and the set-aside program, which, depending on the point of view, either work fine or conspire to cut the smaller firms out of desperately-needed defense business.

Armed with million-dollar figures, AF officials lauded the weapons system technique that places design and production responsibility in the hands of "coordinating" contractors.

Assistant Air Force Secretary Dudley Sharp told the Smathers' Small Business Subcommittee on Procurement that, despite some small business gripes, the weapons system concept:

Does not give any contractor the right to concentrate work in his own plant.

Does not reduce subcontracting.

But a Chicago manufacturer of aircraft components unfolded a different tale. H. C. Johnson, Jr., President of the National Die Casting Co., claimed his military business sagged to zero this year from a 1950 annual volume of $1.38 million.

Under the weapons system procedure, he contended, small business in general, and his firm in particular, was being edged out of the procurement picture.

The young manufacturer, who heads a 36-year-old firm, did not accuse Air Force officers of discrimination against small business. The trouble, as Johnson outlined it, lies in the incapacity of smaller firms to compete with big business.

While the industry "giants" assign company leg-men to major procurement centers to negotiate for new AF business, small business often can't afford this strategy. Consequently, as Johnson explained it, the little fellow is compelled to hustle around to numerous prime contractors, perhaps to be turned down in the end.

Despite attempts to market needed B-6 accelerometers and oxygen regulators, Johnson complained, he was unable to interest AF buyers in his product.

What seemed to be thwarting Johnson, the AF said, could not be broadly applied to a large segment of the small business world. Fact is, contended the AF, smaller firms are doing a brisk trade with the service, and things aren't nearly as black as people are painting them.

Secretary Sharp said small plants operating on prime contracts for items that must be produced to Air Force specifications are now doing a volume equal to that at the peak of the Korean buildup. At the end of 1956, he testified, small concerns were operating on prime contracts totaling $560,136,000, an average of $311,000 per plant.

"In summing up this prime contracting picture, I can find no evidence . . . that the weapons system concept, as used in the Air Force, has any adverse effect on the ability of small business to secure contracts directly from the Air Force."

In this he was supported by Deputy Assistant AF Secretary Max Golden. Of 1,700 AF procurement items, Golden explained, only 36 have been shifted into the jurisdiction where the purchase is made by the prime contractor, rather than the Air Force itself.

Golden told the Subcommittee the concept had been subjected to many "misconceptions." The Air Force, he assured the Senators, continues to buy many items directly. One thing weapons system *does not* mean, the procurement officer maintained, was that any single contractor retains authority to buy everything for a given project.

Sharp further asserted that the small-business share of the subcontracting dollar was climbing. Between July and December last year six AF weapon system contractors won defense contracts worth $1,494,510,000.

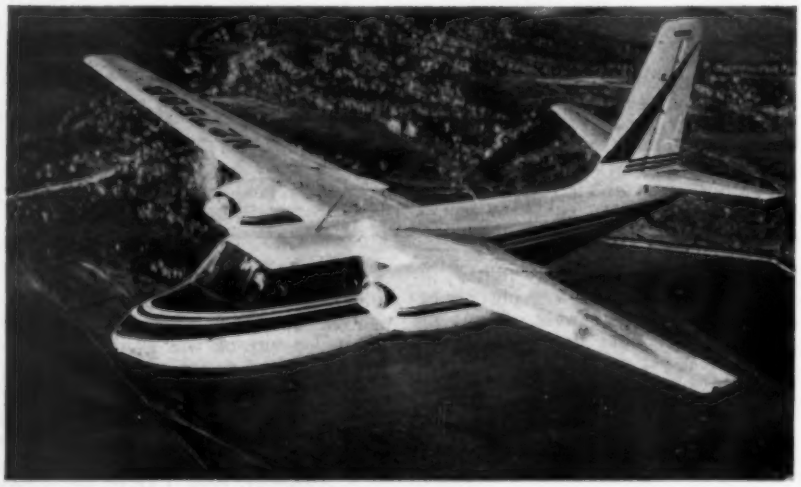
In the same period, he said, they paid out $813,052,000 to outside business firms, of which 23.2% went to small business. Reports from contractors in a like 1953 period disclose they farmed out only 16% to smaller concerns.

At the end of three days of hearings the Subcommittee agreed to work out other problems directly through AF procurement officers at the Pentagon. No immediate recommendations were made.

Earlier, however, Pentagon officials told the same Subcommittee they would take another look at their methods of procuring jet fuel and other oil reserves. A query was ignited by charges of independent refiners who claimed Defense's "weighted average" buying policies were hurting small business.

E. Perkins McGuire, Assistant Defense Secretary (Supply & Logistics) told the Smathers' group his office would examine the technique for possible flaws.

Nub of the charge was that the Pentagon's "weighted average" policy allowed the government to pay major refineries more per gallon than it was paying small concerns bidding on set-aside portions of the same order.



Aero Commander Model 560-E

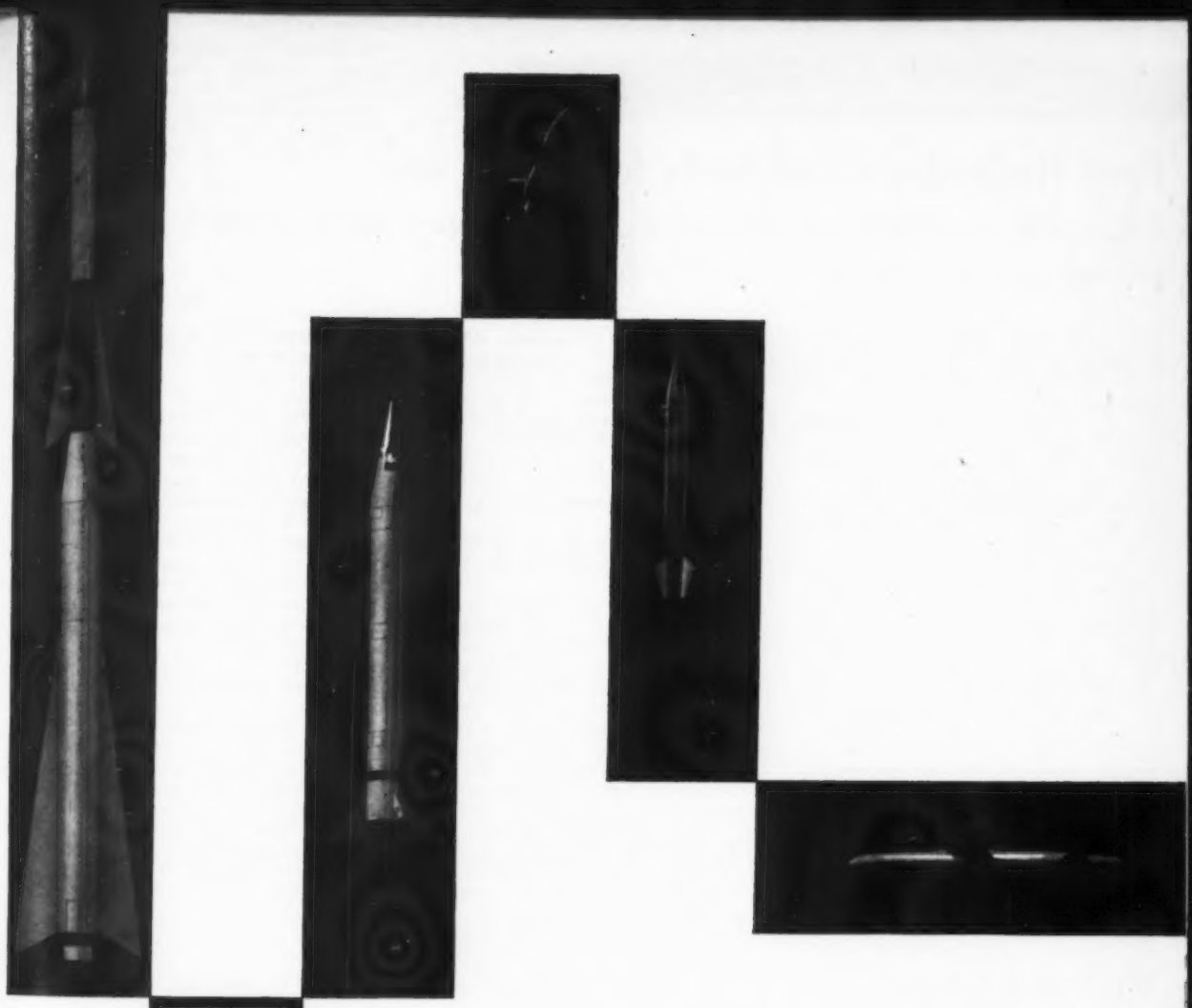
LATEST AERO COMMANDER model features 49-ft. span, high aspect wing, increase in gross weight to 6,500 lbs., range of 1,625 mi. Wingspan is five ft. longer than earlier versions, adding 12 sq. ft. to area, increasing aspect ratio from 8.06 to 9.47; wing loading remains 25.5 lbs./sq. ft. despite 500 lbs. increase in load. Top speed 222 mph.

Employment, wage set new industry records

New highs in aircraft industry employment and wage figures were reached in December, when 867,200 employes averaged $100.15 a week in earnings.

Employes working on aircraft engines and parts set an all-time high in weekly wages, averaging $105.36. The industry-wide figure of $100.15 was up from $98.37 in November and $95.57, the yearly average.

November employment was 856,600, the yearly average 804,100.



TOP SCORE With a ten-year backlog of experience in pioneering the new age of rockets and guided missiles... and with five major projects currently in work for the U.S. Army, Navy and Air Force... Martin's contribution to design, development and operation in this advanced field of flight is continually expanding.

In 1946, development was commenced on the Martin MATADOR pilotless bomber for the Air Force... GORGON, a Navy test vehicle... and the VIKING series of high-altitude research rockets. Within two years these were followed by ORIOLE, an experimental air-to-air missile, and PLOVER, a target drone. More recent developments include LACROSSE for the Army... TITAN, the Intercontinental Ballistic Missile for the Air Force... and the launching vehicle for project VANGUARD, the earth satellite, undertaken with the Naval Research Laboratory as a major U. S. contribution to the worldwide science program of the forthcoming International Geophysical Year.

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Free Radicals: super fuels for a new era

These new chemicals can release enormous energies and may push aircraft and missiles faster and farther than ever

by William Beller

SPECTACULAR NEW FUELS able to release enormous energies may soon push aircraft and missiles into new flight regimes.

A few years ago the constituents of such super fuels were only of academic interest. Designated "free radicals," these constituents were later detected and laboratory-produced. Today, the three military services are backing free-radical research on all fronts.

One of the chief scientists in the free-radical program says that space flight is not far off if these fuels do half what they should do. He estimates that we are at the same stage in free-radical knowledge that we were 10 years ago with atomic energy.

Another scientist, Dr. Morton Alperin, director of advanced studies for the Air Force Office of Scientific Research, sees promise of free-radical fuels being used as rocket propellants within the next five to 10 years.

What they are

Free radicals are electrically neutral molecular fragments. Examples of such fragments are H (the hydrogen atom), NH (the imine radical), and OH (the hydroxyl radical). Such a fragment may be called "metastable," or in a state of pseudo-equilibrium, because it has acquired energy beyond that contained in its most stable state. A more stable state of the hydrogen atom would be the hydrogen molecule; of the imine radical, ammonia, and so forth.

Another familiar example of metastability is that of heating water a few degrees beyond its boiling point at atmospheric pressure. If great care is taken during the experiment, the water-to-vapor phase can be delayed as much as 9° above 212°F. When this system is disturbed, the water will spontaneously explode into steam simultaneously with the release of its excess energy.

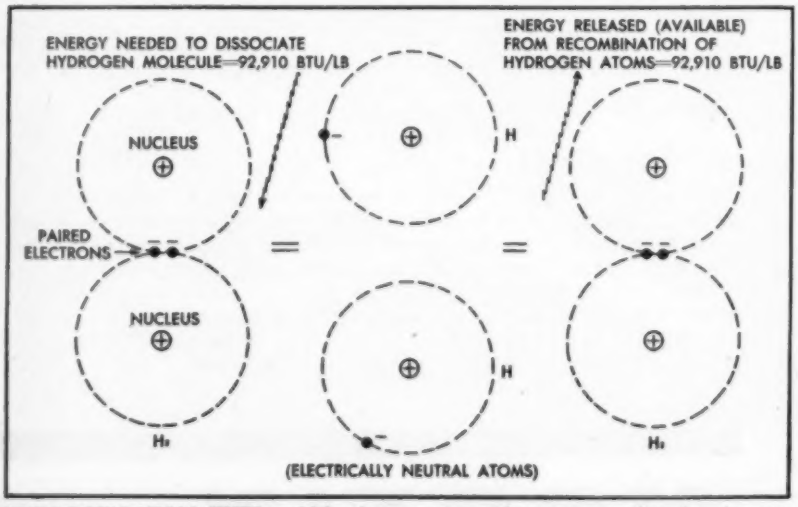
A free radical is not an ion and therefore cannot be detected by its electrical charge.

Unless free radicals are kept apart from each other, they will recombine. This is the reason that it has taken so many years to isolate them. It is also the reason that exceptional means must be taken to stabilize and store them.

Ordinarily, free radicals exist for short periods of time in systems such as flames and hot gases. They are found in the exhaust products of propulsive systems, and are considered a loss unless they recombine before being ejected. These losses experienced by conventional propulsive systems because of dissociation, or lack of recombination, will furnish only a very minor problem in a free—radical system.

The energy released in powerful ordinary chemical reactions per pound of total reactants is of the order of 1,800 to 18,000 BTUs. By comparison, there are free radicals that can store nearly 100,000 BTUs per pound.

In the combustion of hydrogen, for example, 51,500 BTUs per pound of hydrogen are released. In the formation of molecular hydrogen from atomic hydrogen, more than 92,000 BTUs per pound are released.



HYDROGEN-ATOM FUEL, which gives up tremendous energy when its elements combine, is the source of a new power for aircraft and missiles.

What they will do

In terms of today's rocket performance, a tremendous increase in range and payload could be expected through using free-radical fuels. A large increase in specific impulse would be certain. Specific impulse may be thought of as the inverse of specific fuel consumption. It is usually given in units of seconds, and is defined as the number of pounds of rocket thrust delivered per pound per second of propellant flow.

Liquid propellant systems used in standard U.S. rocket practice are nitric acid and aniline, which give a specific impulse at 500 psia of 235 seconds; oxygen and alcohol, a 259-second specific impulse at 500 psia; and oxygen and gasoline, a 264-second specific impulse at 500 psia. Propellants using fluorine as an oxidizer can theoretically give specific impulses of the order of 325 seconds.

If 100 percent free-radical hydrogen could be used as a propellant, then specific impulses five to six times those now obtainable with conventional fuels would be possible. This means that a missile powered by free-radical hydrogen would have 25 to 36 times the range of a similar conventionally-fueled rocket. Space flight would be here.

Unhappily, the problems of producing, storing and controlling such free-radical hydrogen is unlikely to be solved in the near future. A more practical propellant system, which would be at least several times better than any we have now, would use dissociated ammonia stabilized with liquid hydrogen. A 600-second specific impulse at moderate temperatures could be expected with this system, together with a ninefold increase in range over today's best rockets.

Specific impulse alone is not a sufficient measure of performance for a propulsive system. A phenomenal specific impulse could be embodied in a missile unable to leave the ground.

An example of this could be the ion rocket, which receives its thrust from the reaction of directed beams of ions or electrons traveling at speeds near the speed of light. Although here the ratio of thrust to propellant mass flow, which is specific impulse, is exceedingly high, the thrust itself is microscopic.

Free-radical fuels derive their great

value from combining high specific impulses with highly compact energy packages. From such combinations, rockets, ramjets and afterburners could be thrust into flight regimes engineering-wise only now conceivable.

Who is in the field

Laboratories throughout the country, operating under these concepts, are eagerly seeking to capture free radicals in quantity and put them to work.

Aerojet-General Corp., Azusa, Calif., has been working under an AFOSR free-radical R&D contract since 1954 when Dr. Fritz Zwicky, then a member of the company's advisory board and now Aerojet's research consultant, first proposed the study.

The Johns Hopkins Applied Physics Laboratory, Silver Spring, Md., is investigating means of identifying hydrogen atoms stored in solid hydrogen. The laboratory has shown that it is possible to stabilize such a system at 4° Kelvin.

The Naval Radiological Defense Laboratory, San Francisco, is studying the effects of bombarding methyl and ethyl alcohol at liquid nitrogen temperatures by high energy radiations. This work will be related to the free-radical problem.

Within the past six years, many methods have been developed for capturing and storing free radicals, mainly at low temperatures. Recently, by freezing the products of an electric discharge at a few degrees above absolute zero, scientists at the National Bureau of Standards, Washington, D.C., were able to store some types of free radicals in highly excited states, making it possible to study and analyze them by spectroscopic means.

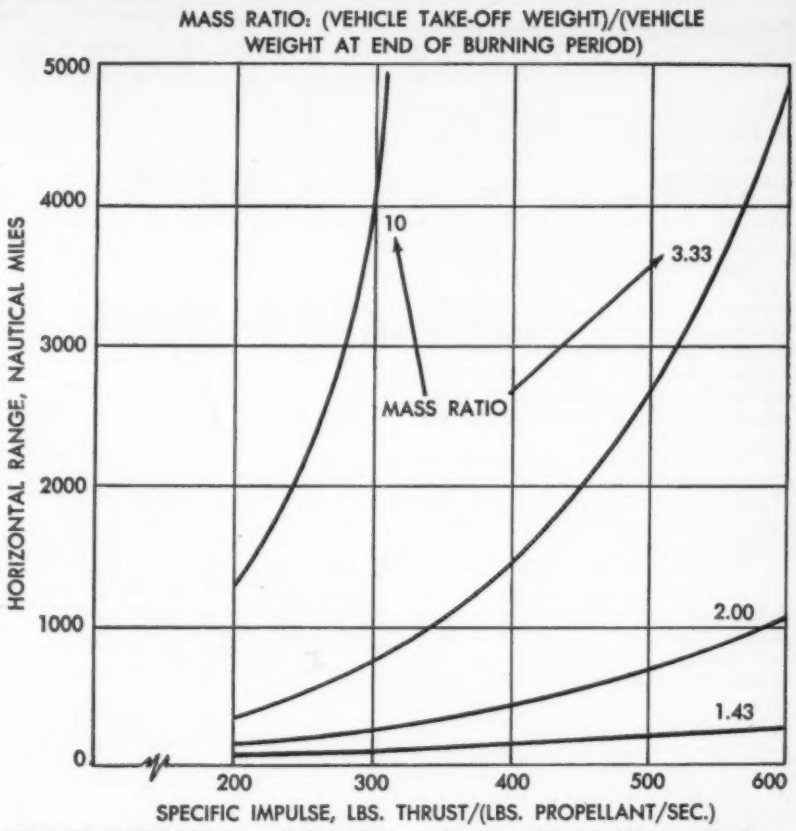
Some results achieved

NBS has produced solids containing atomic nitrogen and oxygen, and possibly atomic hydrogen and an unstable hydroxyl radical. The investigators describe these solids as having very unusual properties, emitting bright glows, blue "flames," and colored flashes of light. When warmed to 20° or 30° Kelvin, the radicals actively combine, releasing vast quantities of stored energy, principally as heat.

These experiments were begun at NBS in 1954 by H. P. Broida and J. R. Pellam. The research was supported chiefly by the Office of Naval Research and the Air Force through AFOSR.

Five months ago a second program of basic research on free radicals was undertaken by the NBS. Scheduled for three years, the program is being supported by the Office of Ordnance Research for the Army. H. P. Broida, chief of the new section, is technical coordinator for the entire program. Arnold Bass assists Broida. Robert Huntoon, associate director for physics, has overall responsibility for the program.

A technical-data center is set up at NBS to follow free-radical research at other laboratories. To knit together the various research projects comprising the Bureau's program, weekly conferences are held. An unclassified free-radical conference is scheduled for September 18-20 at the Bureau.



SPECIFIC IMPULSES for today's rockets are between 200 and 300 seconds. Free-radical fuels can give specific impulses exceeding 600 seconds, and corresponding performance increases.

Three major problems must be solved before free radicals can be used in practical powerplants: production and detection, stabilization, and control.

Production. Free radicals are formed by adding enough energy to a molecule to dissociate it. Heat is the most obvious energy to add. At about 6,000°F and rocket exhaust pressures, 4% of a volume of oxygen, 5% of a volume of hydrogen, and 12% of a volume of water would be dissociated into their respective radicals.

In the upper atmosphere, the sun's radiations are responsible for much of the dissociation of molecules into free

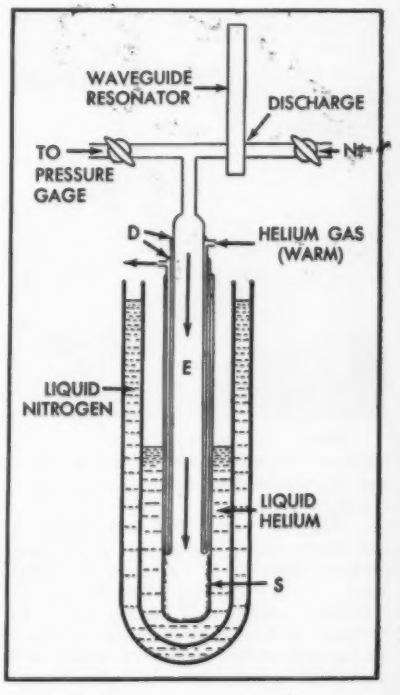


DIAGRAM of National Bureau of Standards apparatus used for collecting and storing free radicals at very low temperature. Nitrogen or other gas is admitted through stopcock at upper right. Gas then passes through an electrodeless discharge in the waveguide resonator, where the gas is broken up into free radicals. Surface S, immersed in liquid helium at 4.2° Kelvin, acts as a trap, freezing out all gases in the discharge products except helium. To prevent solidification of the discharge products at temperatures above 4.2° Kelvin, warm helium gas is passed between the compound walls of the tube E. Liquid nitrogen in outer flask helps insulate the liquid helium column.

radicals. In fact, some intrepid would-be space travelers are proposing capturing these free radicals for fuel for space vehicles.

More conservative means for forming free radicals include high-frequency electric-field techniques such as those used by NBS, and bombardment of the parent molecules by gamma or other type radiations. Thus far, a concentration of roughly one-percent free radicals has been the highest laboratories have reported obtaining. A feasible rocket engine would require free-radical concentrations equal to at least ten percent.

Detection. Means for recognizing and accurately measuring the amount of free radicals in a given matrix comprise one of the fundamental problems of today's research.

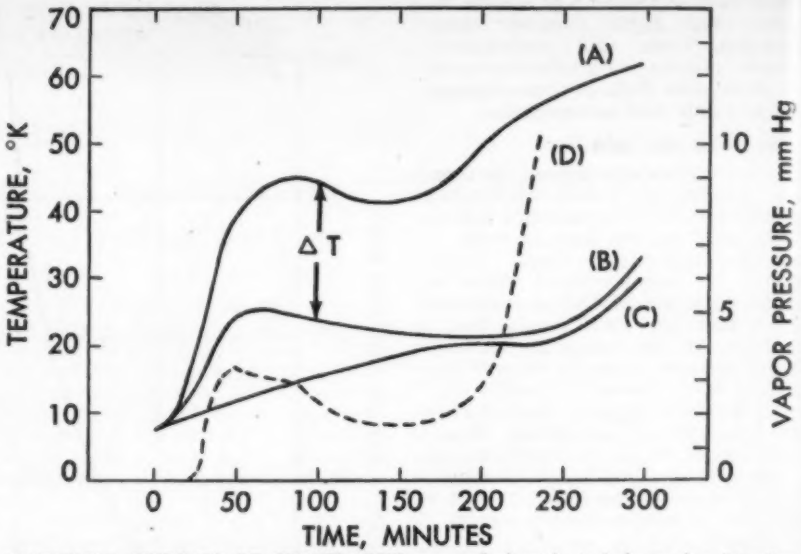
There are several methods in use:

(1) Certain free radicals can be detected by their reactions with metallic mirrors deposited on the walls of a tube through which a carrier gas containing free radicals is flowing.

(2) Radicals have been detected by compounding them with appropriate molecules in their gaseous phase.

(3) Advantage can be taken of the paramagnetic properties of free radicals.

(4) NBS has used calorimetric methods similar to those used for determining the heating values of fuels.



NATIONAL BUREAU OF STANDARDS uses calorimetric techniques for detecting presence of free radicals. A large and rapid temperature change is observed in warm-up curve of solid nitrogen condensed from gas discharge (A). Temperature rise results from large amount of heat energy released by nitrogen atoms as they recombine. Compare with warming curves for molecular nitrogen condensed without discharge (B) and the empty chamber (C). (D) is nitrogen vapor-pressure curve.

(5) Spectroscopic methods have also been used by several laboratories.

Stabilization. Today's only method for stabilizing and storing free radicals appears to be by trapping them in near absolute-zero solids. Should this prove to be the only way, then powerplant designers will have to work with fuels contained in bars maintained at extremely low temperatures.

The bars could conceivably contain attenuating spacers. When one end of the bar is warmed, its free radicals would combine and release energy for propulsion. Another idea, but highly speculative, calls for an anti-catalyst that would permit free radicals to exist in a liquid phase.

Sperry gyroscope to produce propellant-driven missile guidance and control devices

Sperry Gyroscope Co. is preparing facilities for development and production of missile devices for use in "outer space."

The company is completing a laboratory for the study of propellant devices adjacent to its plant at Great Neck, L. I. Sperry's Air Armament Division is embarking on a program to harness the tremendous energy released by the new exotic fuels now being used as missile propellants. It believes that such solid and liquid fuels hold great promise for tiny, self-driven precision instruments.

Production of the propellant-driven guidance and control devices will be undertaken at Sperry's main Nassau plant. The new laboratory will be used to provide environmental testing for hot gas servos, gas generators, propellant-driven gyroscopes, mechanical actuators and similar instruments.

The laboratory, believed to be the first of its kind in the world, is built of reinforced concrete and surrounded by an inner fence and moat. Test bays include an altitude chamber for simulating pressures and temperatures found at altitudes up to 100,000 ft.; a vibration and acceleration room and test area to provide shocks approximating the force of meteors in space (40 Gs for 20 milliseconds).

Dummy cockpit helps solve design problems

An inexpensive plywood dummy cockpit enables the Air Force and industry to determine quickly the best cockpit design and layout before money is invested in a hand-made prototype.

Air Research and Development Command is using the dummy cockpit at Wright Air Development Center to find best locations for instruments and controls for future aircraft.

The cockpit consists of plywood panels on which full-scale drawings of instruments are placed. The panels can be moved and adjusted around an aircraft seat to find the most desirable locations.

Entire model is contained in an 8x10-ft. four-poster arrangement with a peg-board floor and ceiling for anchoring vertical poles.

First German-made engine since WW II

First German post-war airplane engine has been developed by Porsche, famous sports car manufacturer. The 65 hp, 1,900 rpm four-cylinder horizontally-opposed engine has oil consumption of 1.5 to 3.5 gals. per horsepower-hour and fuel consumption of 5.6 gals. per hour at takeoff hp to 4.1 g/h at 50 hp cruising.

Bore of the four-cycle engine is 3.25″, stroke 2.91″, piston displacement 96.5″ and compression ratio 7.5:1. Porsche hopes engine will fill the void in European light aircraft industry.

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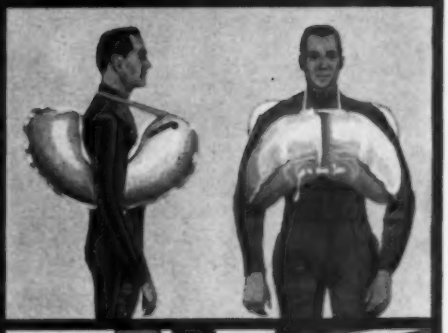

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Eimac: pioneer in ceramic tube-making

Eitel-McCullough first company to use ceramic materials instead of glass; believes they achieve greater reliability

by Henry P. Steier

ONE MANUFACTURER of electron tubes is changing over entirely to ceramic in place of glass as the answer to environmental, reliability and operational demands on tubes for future weapons and defense systems.

Eitel-McCullough, Inc., which pioneered in starting the now booming electronics industry in the San Francisco Bay area and is today the world's largest manufacturer of transmitting tubes, says any new designs it makes will use ceramics.

The company adopted the slogan of "Eimac-first in ceramics" for its showing of tube types, running from the smallest tubes to the world's largest tube using oxide-coated cathode material at the recent national convention of the Institute of Radio Engineers.

Other firms have begun to look to ceramic as the future tube material. General Electric has announced pilot production of receiving types using ceramic. Sylvania has a similar project.

Raytheon has been working on ceramic magnetrons and Varian has been trying out the material in its klystrons.

Co-founders of the Eitel-McCullough firm, William W. Eitel and Jack A. McCullough, told AMERICAN AVIATION "some people think ceramics are not really here yet."

Despite this the firm does not intend to make any new Eimac designs of glass. Faith of the two men in future prospects for ceramic is borne out by experience to date and production machinery being designed.

Giant Ceramic Tubes

Eimac has completed construction of a giant klystron experimental tube 10 feet 5 inches in length using ceramic in the tube envelope.

Designated the X626, the tube uses an oxide-coated cathode and will be employed for special pulsed radar amplifier applications. It delivers 1¼ million watts peak power and 100 kilowatts average power.

Frequency and application of the tube are classified but it is in the UHF region. Possible uses for such tremendous power could be in the U.S. defense radar environment or for U.S. based Nike-type Army installations.

Other uses might be in linear accelerators such as those being developed by Varian Associates for the chemical processing industry. Rocket fuel developers are already showing strong interest in linear accelerators for processing fuel materials.

Use of an oxide-coated cathode as an electron source in tubes of this size, or in critical defense applications, where tube failure could be disastrous, opens up new vistas in ceramics.

Previously, electron emitters such as tantalum were used despite the high power needed for energizing the emitter and despite tube complexity problems created by such materials.

Oxide-coated type cathodes are sensitive to residual contaminants remaining in a tube after processing. This is a deterrent to their use in expensive, super-high-power glass-envelope tubes.

According to McCullough, the proneness of oxide cathodes to go bad suddenly, and thereby prevent a tube from operating, is caused primarily by the environment inside a tube, not by any lack of understanding of how to process or fabricate such a cathode.

A debate on this question has been carried on in recent months in the Proceedings of the Institute of Radio Engineers. When the director of a well-known tube reliability research project said that the physical mechanism of oxide cathode operation was completely understood, scores of objecting letters from workers in this field were received.

Eitel and McCullough declared the oxide cathode is not the problem. "It is the environment," they agreed. "You need a vacuum and must get rid of the contaminants. It is the techniques you use to get rid of these that count."

According to these men, the extremely high bake-out temperatures that can be used during processing ceramic tubes to get rid of cathode contaminants is the reason for the bright prospects for oxide cathodes in ceramic tubes.

These temperatures, if applied to glass envelopes during processing, would be way beyond the melting point of the glasses used, and would cause collapse of the structure.

Another factor is environmental temperature. A new smaller type of ceramic power tube made by Eimac can operate in an ambient temperature of 250°C, compared to the limit of 175° for glass types.

During the processing stages of tube manufacture, hospital-like measures must be taken to insure that some contaminants are not left in the tube during final bake-out processing.

Use of ceramics permits much improved handling during production. Chemical cleaning of the glass is eliminated, for example, and the existance of unknowns in glass composition is not a hazard.

Klystron tubes using glass and tantalum cathodes made by Eimac for use in the Arctic radar and communication defense networks, have given up

BILL EITEL (left) and Jack McCullough, co-founders of Eitel-McCullough, Inc., take the measure of 10-ft., 5-in. ceramic klystron that delivers 1¼ million watts peak power for new defense radar applications. White rings are ceramic material which result in higher power radars and better tube reliability.

to 17,000 hours of satisfactory service.

Positive Processing of Tubes

Bill Eitel believes the new ceramic with oxide cathode tubes will give equal service in the defense system and have the added advantage of being able to deliver more power with lower power consumption.

To energize the cathode on tantalum types takes up to 1,700 watts and in the oxide types takes only about 500 watts.

Another big gain realized in the new klystrons is the long pulse length permitted with new types of oxide cathodes being put to use. This gives higher peak powers.

Pulse lengths of 2 milliseconds will permit the new giant klystron to deliver 1¼ million watts of peak power needed to search out the relatively microscopic ICBM missiles at great distances, and produce more effective communication over longer distances.

Important to SAGE's success

According to information not yet made public in detail, success of the frequency modulation-continuous wave communications network being built to alert and tie together the vast semi-automatic ground environment (SAGE) defense network will rely heavily on more powerful microwave tubes.

This type of communication, AMERICAN AVIATION has learned, is related to activity of meteors in the upper atmosphere. The more meteors there are, the more ionization occurs in the troposphere.

Distances that individual relay stations can cover with the new communications technique are much beyond usual line-of-sight limitations at microwave frequencies. Three hundred to 700-mile ranges are said to be practical with the troposphere technique.

As the ionization increases, the microwave energy bounced back from the tropospheric layer increases. The defense system now designed to transmit both digital and voice data must have enough effective power to cope with lowest meteoritic activity conditions. This means megawatts of power are needed.

Scientific measurements of meteoritic activity to be made with the IGY satellites are expected to aid design of the SAGE network by allowing best placement of defense communication gear.

New Power Rating

Eimac is also expanding use of ceramics in small power tubes employed in airborne and missile electronics. A new ceramic power tetrode designated 4CX300A has gone through evaluation in missile telemetry equipment and is expected to find wide use in radio-frequency power amplifier or oscillator applications in aircraft.

The tube uses stacked construction with tube elements formed as conical shaped pieces and a flange at the bottom of the cone. The flanges are used as element contacts. Ceramic rings form the tube envelope.

Splines cut in the flanges are used during tube manufacture to keep internal parts in alignment and thereby achieve new orders of accurate assembly, improved tube performance.

NEW POWER TUBE and its special socket. Splined flanges are inserted into socket and tube is twisted to lock it into place. Large ring at top is heat radiator.

The splines also act as a keying means for inserting the tube correctly into a new socket the company has designed. The socket carries its own built-in bypass capacitors.

For operation in the 500-megacycle region, the new ceramic tetrode has a very high plate power rating for its size. The 2 3/8-inch long tube has a rating of 500 watts.

Repeated inputs of up to 2000 watts on the 4CX300A plate without tube deterioration have dramatically demonstrated what ceramics can do for tube reliability.

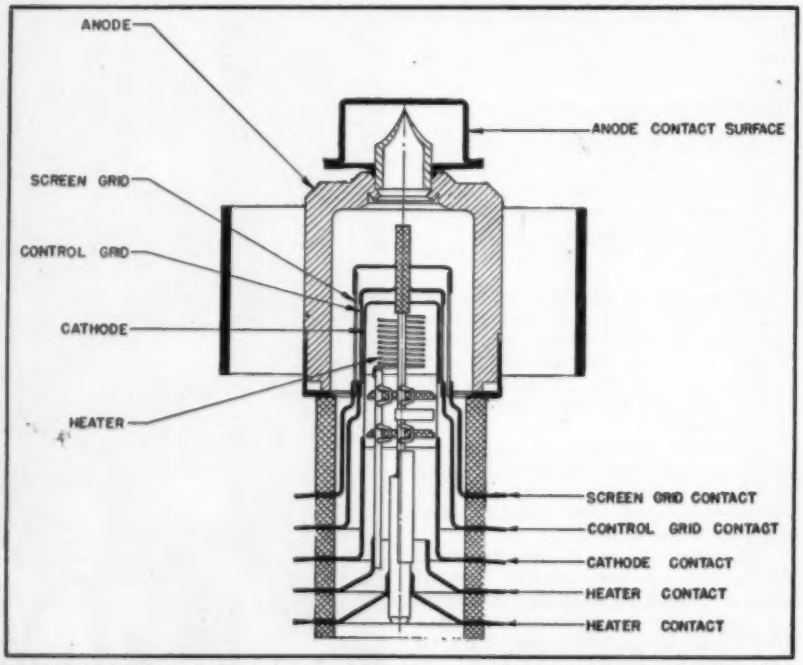
The manufacturer of missile telemetry equipment who has tried and accepted the new power tube needed a tube capable of taking up to 20Gs and operating over a frequency range of 20-2,000 cps with less than 1% residual amplitude modulation in the FM system used.

As rated, the tube can take repeated 11 millisecond 50G shocks in any direction without internal shorts of mechanical damage. Under these shock and vibration conditions ranging from 30-2,000 cps, tube noise is low.

Eitel and McCullough believe the use of ceramics in tubes will eventually make sockets unnecessary. They feel that socketless designs are in the offing in view of their belief that ceramic tubes can be made as reliable as other soldered-in components. The necessity for removing tubes will be eliminated entirely.

Plans are under way in the company to produce receiving type ceramic tubes of three types. These are a pentode, triode and twin-triode. Automatic assembly machines designed to produce the new tubes at rates of 900-1,000 per hour are being designed.

The company is in pilot production of the double triode. This and other small receiving types will find wide application in the increasingly severe environments of new weapons systems. The tubes can take up to 1500Gs without changes in the tube envelope.



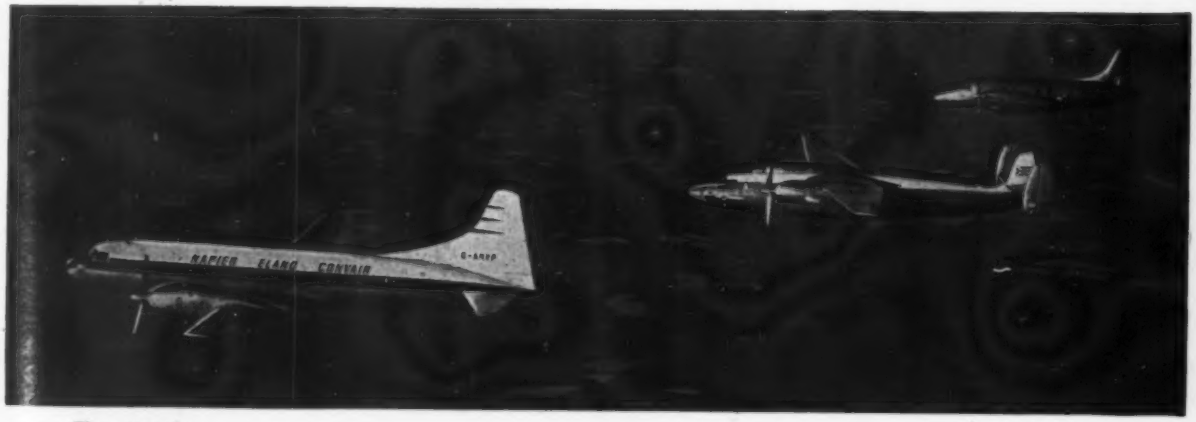
CROSS-SECTION of Eimac's new 4CX300A ceramic power tetrode, 2⅜ in. long. Double cross-hatched sections are ceramic material that enables manufacturer to improve tube processing. Thus tubes can be built with higher power input of 500 watts and ability to withstand 50G shocks.

THE ERA OF THE ELAND IS BEGINNING...

Every medium-haul airline in the world is faced with an urgent decision: how, and how soon, to convert to turbo-props in the 3,000-4,000 e.h.p. range.

It becomes clearer every month that ELANDS are the simple and immediate answer. Because of its single-spool design the ELAND is inherently safe and fundamentally economical to run and service. Because of its extreme flexibility in performance it is adaptable to any and every operating condition. And because of its simplicity and its excellent power-weight ratio it is a good engine for conversion projects. The case of the Napier Eland Convair—bought from the makers and converted to ELANDS—is a convincing illustration.

Few structural alterations. Installation of ELANDS in the Convair 340 has meant remarkably few modifications—and these have taken place ahead of the main engine bulkhead frame, which has otherwise been retained unaltered from the original installation. Other alterations have been confined to the instrument panel, the control quadrant, and the aircraft electrical system (adapted to include a circuit for Napier 'Spraymat' electrical de-icing of engine intake, propellers and spinners).



Three examples of successful Napier Eland conversions: the Convair 340, the Elizabethan, the Varsity.

The profit of ELAND operation—From studies made of the published direct operating costs (including depreciation) of a number of typical airlines, it is proved that in the light of our guarantees a converted aircraft will be cheaper to operate—whether the costs are calculated on the basis of aircraft miles, ton miles or passenger miles. Such calculations, of course, take no account of the increased revenue which will be earned by this, as by all other turbine-engined aircraft thanks to greater passenger appeal.

Eland conversion means increased profits to the progressive airline

D. NAPIER AND SON LIMITED • LONDON, W.3, ENGLAND Partners in Progress with The ENGLISH ELECTRIC Company Ltd.

Representatives: J. C. K. SHIPP & A. GUALTIERI, Suite 909, Dupont Circle Building, 1346 Connecticut Avenue N.W., Washington 6, D.C. Tel: Dupont 7-2123 — P. J. WAITE, 6035 Cote-de-Liesse Road, Montreal 9, Quebec

CRC E26

U.S.S. Missouri Firing 16-inch Guns, Official U.S. Navy Photo

THE U.S. AIR FORCE F-104 STARFIGHTER CAN OVERTAKE A 16-INCH SHELL IN MID FLIGHT. IT IS THE WORLD'S FASTEST JET. DESIGNED AND BUILT BY LOCKHEED.

LOCKHEED *means leadership*

LOCKHEED AIRCRAFT CORPORATION: MISSILE RESEARCH & DEVELOPMENT • NUCLEAR-POWERED FLIGHT • ADVANCED ELECTRONICS • JET FIGHTERS • JET TRAINERS • PROPJET TRANSPORTS • LUXURY LINERS

THE ARMY [illegible]

NEW PRODUCTS

RCA instrumentation radar system directly calibrates and evaluates missile performance

Direct calibration and immediate evaluation of performance of missiles is possible with RADIO CORP. OF AMERICA'S new instrumentation radar system.

Designated AN/FPS-16, the system was developed to a joint services specification resulting from a consolidation of Navy Bureau of Aeronautics and Army Signal Corps contracts. Equipment will be used by Army, Navy and Air Force.

Radar is designed for installation as a fixed station and has a specially-designed enclosure. Antenna pedestal mounts on a tower detached from main enclosure to minimize vibrations.

The system can track with accuracy over extended ranges, in darkness, through clouds, under any atmospheric conditions and yield data that can be reduced almost instantly to final form, according to RCA.

Prior to the RCA development, data have been obtained by optical devices, radio triangulation systems and modified radar equipment. Data reduction usually required months for computation. The RCA instrumention radar obtains accurate trajectory data and makes it available immediately.

The radar can check performance of drone, satellite and other free-space moving targets with and without beacon transponders.

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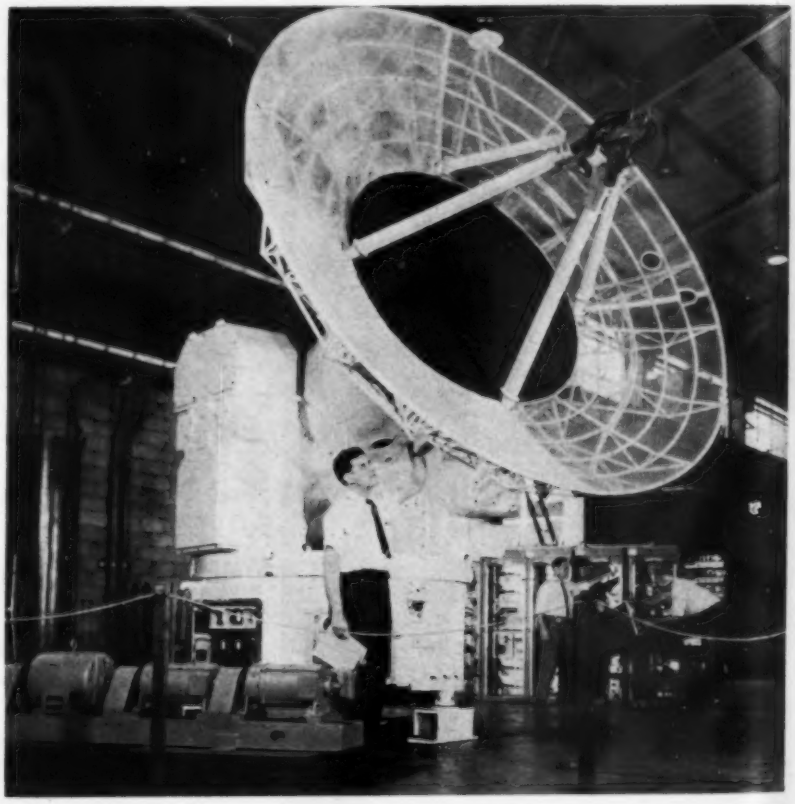

Copter homing instrument

CLOVER FIELD RADIO SUPPLY CO. is producing a new homing device for helicopters. Called Helihomer, the device operates on 460 to 470 megacycles in the UHF range.

Helihomer plugs into 110v ac and has a 24-volt dynamo and two antennas. Device navigates by following bearing from a fixed-point transmitter.

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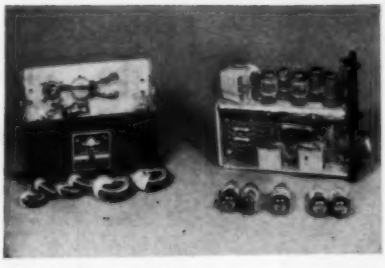

Magnetic amplifier

RYAN AERONAUTICAL CO. has designed a magnetic amplifier said to be 20 times as reliable and 1/3 the size and weight of the vacuum tube amplifier it replaces.

Amplifier uses no tubes or power supply. It employs magnetic coils wound around nickel-iron cores. Weighs 1½ lbs.; accepts any type signal. Heat dissipation is low. Accepts line power.

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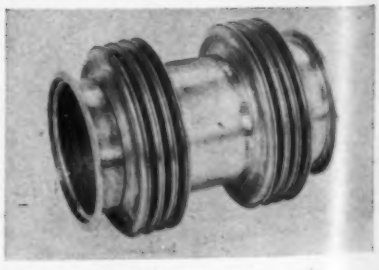


Titanium bellows

TITEFLEX, INC. is producing titanium bellows weighing 44% less than stainless steel counterparts for aircraft ductwork.

Bellows allow thermal expansion and contraction in ductwork and are made of special titanium alloys supplied by Rem-Cru Titanium, Inc. Sizes range from 1" to 3½" inside dia. Will operate at 50 to 400 psi.

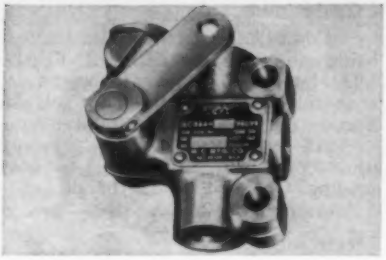
Circle No. 146 on Reader Service Card.

Air conditioners

Mobile air conditioners for use in testing of jet aircraft are being produced by Electric Machinery & Equipment Div. of AMERICAN ELECTRONICS, INC.

Airflow is automatically controlled to any preset value between 10 and 60 lbs. per min. regardless of variations in static pressure, ambient or discharge temperature.

Circle No. 111 on Reader Service Card.



Air control valve

A 3-way air control valve offered by M. C. MFG. CO., MC 2664, is designed for use with air or nitrogen.

Ambient temperature range is —65°F to 225°F. Operating pressure 3,000 psi, burst pressure 7,500 psi.

With pressure port connected to cylinder port and 500 to 3,000 psi at pressure port, internal leakage is one bubble in 2 min. Weight, 0.28 lb.

Circle No. 105 on Reader Service Card.

VHF receiver

NOVA-TECH, INC.'S low-cost VHF receiver picks up radio communication of aircraft, military test frequencies, ground control approach, tower, flight and weather monitoring. Air-O-Ear has 6-tube superheterodyne circuit, noise squelch control, selenium rectifier, automatic volume control, coaxial tuning, drift compensation, 6" oval speaker, tuning from 108 to 130 M.C.

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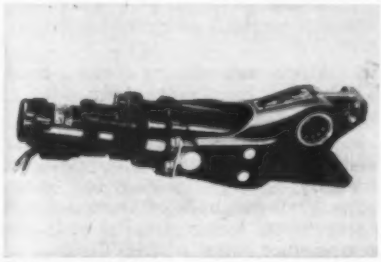

Rotary actuator

A new 400-cycle ac rotary actuator has been developed by ELECTRICAL ENGINEERING & MFG. CORP. to operate on a frequency range of 320 to 480 cycles. Labeled EEMCO Type D-822, the actuator eliminates the need for a constant speed drive for the generator system in the aircraft.

Type D-822 operates under normal load of 26,000 inch-pounds.

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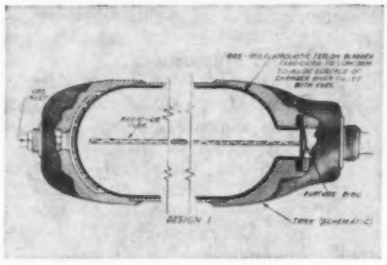

Seamless fuel bladder

JOCLIN MFG. CO. is producing Teflon seamless fuel bladders in any size or shape required for use in extreme temperatures encountered by ramjet and rocket engines in the flight of missiles (-450°F to 550°F). Bladders are made to conform to size of metal containers. Sketch shows how gas entering one end can propel fuel from other.

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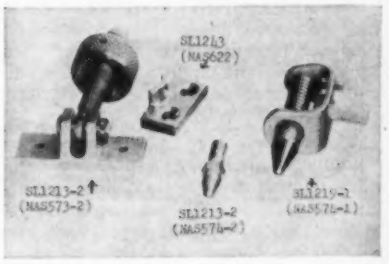

Shock-mounting equipment

SHUR-LOK CORP. offers a new series of lightweight shock-mounting equipment for electronic, radar, missile and aircraft use.

Included is a rear mounting pin assembly (NAS 574). Spring-loaded, corrosion-resistant, solid steel pin, frame is clad aluminum, conductive-coated.

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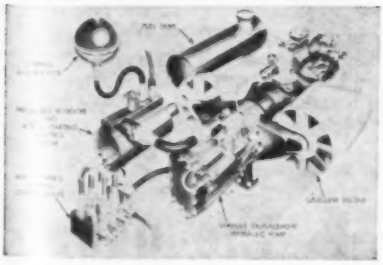

Turbine engine starter

A new hydraulic starter package for aircraft turbine engines, which can also be used as an auxiliary source of hydraulic power has been announced by VICKERS INC.

Starter has lightweight, air cooled gasoline engine which drives variable displacement pump. Oil under pressure powers hydraulic motor mounted on engine pad to start turbine. Built-in controls regulate torque and speed for maximum power during entire starting cycle.

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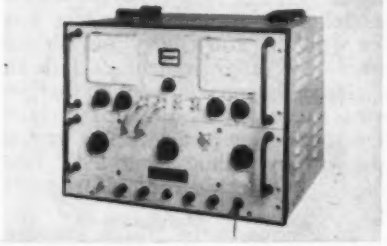

Microwave stability tester

Changes in frequency of microwave oscillators can be measured to a high degree of precision by Model 5004 Microwave Stability Tester made by LABORATORY FOR ELECTRONICS, INC.

Instrument measures drift, rate of drift of oscillators. Adaptable to take readings at S-,L-,C-,X-band. Measurements can be taken at 30 mc and from 30 kc to 230 kc. Readings can be taken instantaneously and monitored continuously.

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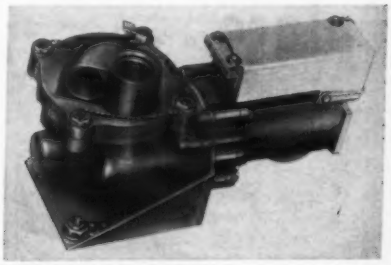


Selector valve

WM. R. WHITTAKER CO., LTD., has designed a 125-psi sleeve selector that provides electro-hydraulic control of fail-safe close drive or speed brake flaps.

Solenoid operated, 4-way, 3-position selector valve permits flaps to be extended and locked in any position. Unit operates at fluid and ambient temperature range of —65° to 300°F, with operating pressure of 3,000 psi at —65° to 300°F.

Circle No. 152 on Reader Service Card.

NEW PRODUCTS

Transistorized amplifier

TABER INSTRUMENT CORP. has developed a high-gain, low-power, plug-in transistorized amplifier for servo and audio applications. The silicon transistor amplifier has 1% gain stability—60° to 125°C.

Amplifier uses new circuit developments including a new dc feedback technique. It is tiny, light, tough, suitable for portable and airborne instrumentation. Output: 1 milliwatt into 10,000 ohm load.

Circle No. 115 on Reader Service Card.

Circular slide rule

Controller, a circular calculator, is being produced by SILVER BELLS LTD. Small (3″ diameter), the circular slide rule is capable of every calculation except addition and subtraction.

All metal, weight 1 oz., does not wear, break, rust. Colors used for easy reading. Operated by one hand.

Circle No. 142 on Reader Service Card.

Electronic flashers

Miniaturized electronic flashers designed to meet most demanding requirements of vibration, shock, temperature stability and radio noise suppression have been developed by ELECTRONIC SPECIALTY CO. RC oscillator circuits used; offer advantages over thermal, motor-driven devices; have excellent frequency stability; easily temperature compensated; maintenance free.

Circle No. 104 on Reader Service Card.

High-reliability relay

RADIO CORP. OF AMERICA has developed a high-reliability dc relay (RCA-206W1) for missiles and other aircraft applications.

Relay is rotary-type, 2-pole, double-throw designed to withstand extreme temperature, humidity, shock. Can be used up to 80,000-ft. altitude.

Device has palladium contacts, balanced rotary motor, one-piece extruded can with silver-soldered mounting flange. Dimensions 1.55″ length, .634″ diameter.

Circle No. 117 on Reader Service Card.

Servo accelerometer

DONNER SCIENTIFIC CO.'S Model 4112 linear servo accelerometer incorporates a high gain electro-mechanical amplifier in closed-loop operation.

Model measures or controls linear acceleration over range from 0 to 25 cps.

Internal servo system provides resolution of better than .001% and linearity within .1% of full range. Withstands hundreds of Gs and can be compensated within .1% full scale over temperature range of 100°C.

Circle No. 116 on Reader Service Card.

A little pull in the right place . . .

the ROBINSON wire twister

Aircrafts' Who's Who Reports

A cross section of the Who's Who in the aircraft industry—including Douglas, Allison, Fairchild, Grumman, Martin, Republic, Canadair Ltd., Pratt and Whitney among a host of others — is reported to have reduced engine wiring time as much as 66%. This saving is effected by the use of the new Robinson Wire Twister, an improved model of the ones that have seen service with the army, navy and airforce since 1943. Improvements include the exclusive diagonal jaw design that permits easier access to hard-to-reach areas, and clamps a vice like grip on the wire by pulling it into a 30° bend thus delivering added leverage for twisting.

In addition to the greatly increased engine wiring speed, users attest to improved shop safety — fewer skinned knuckles and bruised fingers.

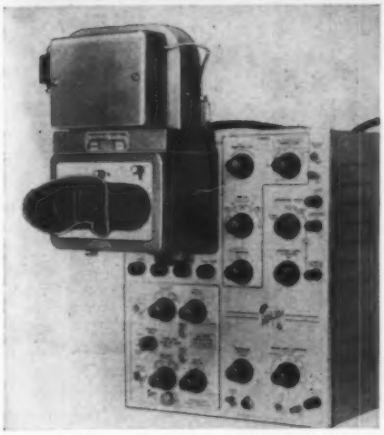
Besides their production line assignments, Robinson Wire Twisters readily adapt in the shop to bench work, on radio and radar equipment, on magnetos, carburetors, instruments and sub-assembly work of all kinds.

List price is $18.50. Write for fully descriptive literature to Ralph C. Robinson Company, Dept. M, Box 3494, 2516 Crosby Way, North Sacramento 15, California.

. . . saves ⅔ the usual wiring costs

the ROBINSON wire twister

NEW PRODUCTS



Oscilloscope camera recorder

Beattie oscilloscope camera recording system, Model K-5 is being manufactured by PHOTOGRAPHIC PRODUCTS, INC.

Recorder is compact, designed to mount on all makes and types of portable and rack-mounted oscilloscopes. Basic periscope system provides binocular viewing hood, interchangeable camera and magazine assemblies. Supplied for either 115 volts ac or 28 volts dc.

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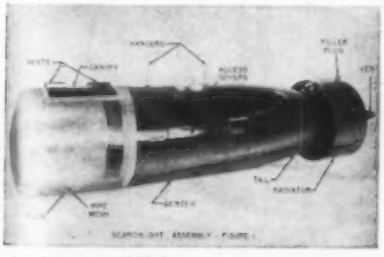


Aerial searchlight

AMERICAN BOSCH ARMA CORP'S Arma Division has developed a powerful new aerial searchlight (AN/AVQ-3) that almost doubles the maximum light output and shines 30 times as long as previous models.

Primary purpose of the light is to illuminate targets for sub-killer aircraft, presumably newer types such as Grumman's S2F-1 Tracker. The carbon arc lamp can be set to shine straight ahead or to sweep an area and it can be directed either by aircraft radar or by hand.

Maximum light output of Arma's airborne searchlight is 130 million candlepower. Duty cycle is 15 minutes on and 15 off. This cycle can be continued as long as the positive carbon supply lasts. An automatic recarboning system of the light unit continuously feeds positive rods stored in a magazine.

Other features, according to Arma: stable operation attained with small trim angles between electrodes and without ballast; transitor operation under wide temperature limits and elimination of warm-up time; use of water cooled contacts under airborne conditions; use of lightweight components to control high arc currents within limits irrespective of voltage fluctuations.

Specifications of AN/AVQ-3 include:

Brightness of source, 1,200 cd/sq. mm; arc voltage D. C., 75-80; arc current, 180; carbon burning rate, positive 35″/hr., negative 3.5″/hr.; reflector type, parabolic; reflector diameter, 17¼″; reflector focal length, 6″; beam spread, 4°; carbon trim angle, 16°; housing diameter, 20″; housing length, 94″.

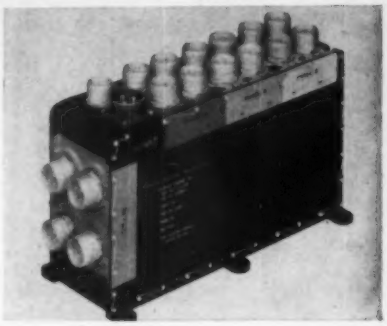
Current control, multi-contact relay; focus control, photo-electric; short carbon cut-off, probe; positive carbon, 11 mm Ultrex; negative carbon, 8 mm graphite; amplifier, transitor-magnetic; positioning system, remote-manual and automatic.

Circle No. 112 on Reader Service Card.

Radar tube

Amplitron, a new electron tube developed by RAYTHEON MFG. CO., adds radar ability to see targets more clearly and farther away. Tube boosts energy output of radar's basic signal as much as 8 to 14 times. Effective range of Raytheon sets for CAA will be increased from 200 to 350 miles by the Amplitron. Can be carried by planes and missiles.

Circle No. 199 on Reader Service Card.



Switching equipment

COLE ELECTRIC CO. has come up with a new concept in airborne electrical switching equipment for use in the Northrop Snark ICBM.

A metal-clad miniaturized substation, the unit transfers 88 electrical circuits and 7 signal circuits from ground test power to airborne power in 2½ seconds at Snark's takeoff. It is operated by remote control and provides instantaneous synchronization—make before break—assuring a constant power supply, according to Cole.

The 28-lb. device replaces one weighing several hundred pounds and eliminates all relays, coils, cores, magnetic armatures and vacuum tubes.

The unit draws 6.2 amperes at 28 volts for 2.8 seconds maximum. Total current is 434 watt-seconds. It provides 22 contactors per phase, a total of 66-400 cycle contacts S.P.D.T. and

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Curtiss-Wright Corporation, with multi-plant operations in many sections of the country, has a permanent program of diversified product expansion which presents unusual opportunities for engineers in many fields of research and development. There are immediate openings for:

FLIGHT TEST ENGINEER – with several years' experience as head of flight test section for aircraft or missile manufacturer, to organize and operate analysis section at new defense plants and at military proving ground. He will set up test procedures for military services and work with laboratory and environment test sections. Headquarters will be in Utica, Michigan.

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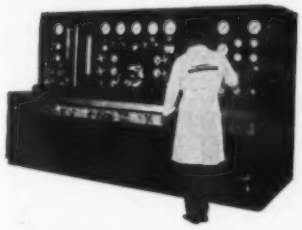
IT IS NOTEWORTHY that PAC is the first private organization to perform rework and modification (including test and calibration of accessories) of J-57 engines, leaving no doubt of PAC's leadership in the engine overhaul field!

LONG-TERM contracts providing for overhaul of Pratt & Whitney R-2800-CB engines of the Flying Tiger Line and Slick Airways fleets have been added to PAC's DC-4 engine overhaul contracts now in effect with these same carriers. This brings to eleven the number of airlines who contract with PAC for engine overhaul.

PAC TEST EQUIPMENT production has reached a new high in deliveries with facilities being rapidly expanded at both the Linden, N.J., and Burbank, Calif. manufacturing plants. Whenever specialized engine and accessory test equipment is needed for entirely new uses, PAC's engineering and production capacity provides the answer. In development at PAC's Linden plant are entirely new types of test and ground equipment for jet engines. Currently, PAC is working with major airlines to provide test and overhaul equipment for their jet powered fleets now on order. One of the reasons why PAC has become America's center for engine repair and overhaul is that much of the test and

overhaul equipment used is of PAC design and manufacture — engineered to perform with accuracy and complete reliability.

PACAERO Engineering Corp., formed to continue the production



An example of PAC's line of test equipment is the combination fuel, vacuum, hydraulic pump and accessories test stand shown above.

of the incomparable "Learstars" is another PAC contribution to the business and executive aircraft industry. In facilities covering over 240,000 square feet at Santa Monica, Calif., PacAero will continue modification and re-manufacture of all types of aircraft. PACAERO and PAC's overhaul facilities provide aircraft overhaul and modification services not available from any other source.

PRATT & WHITNEY Aircraft Engine Forums will again be conducted under PAC auspices this year. Forums are scheduled for Denver (May 14), Burbank (May 17), Oakland (May 20), and Seattle (May 22). Operators desiring to attend are invited to write PAC for reservations and arrangements for tie-down.

For aircraft operators who have specific requirements, brochures covering all phases of PAC services — engine overhaul, airframe overhaul and remanufacture, accessory overhaul, test equipment and ground handling equipment have been prepared. Write your nearest PAC plant; tell us your needs, and proper information will be supplied promptly.

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WEST COAST TALK

by Fred S. Hunter

Irony: American Airlines' idea gave birth to Electras, but Eastern will get 'em first

MOST PEOPLE forget that the Lockheed propjet Electra actually originated with American Airlines. AA set up the requirements for a four-engine turboprop and invited the various aircraft manufacturers to submit designs. Lockheed won this competition. AA gave Lockheed an order and that put the Burbank manufacturer in the propjet business. Thus it seems a little ironical that Eastern Air Lines will be taking delivery on about 10 Electras before AA gets its first one. But that's how it came out when AA decided on major changes in the original Electra interior in order to provide what it considers a more attractive cabin. AA decided the innovations will be worth the delay in delivery.

Invariably, at North American Aviation stockholder meetings, someone asks whether the company has any plans to venture into the commercial transport field. This year's annual meeting was no exception. The question from the floor brought a typical grin from "Dutch" Kindelberger. Yes, he admitted, the company had thought about a commercial jet transport. But the last time the executive staff had done so, he added, they spent a day going over all the arithmetic and then decided Lee Atwood had summed it up about right when he said: "Looks like a good way to lose $30,000,000."

We're pretty disappointed in the Air Force. We thought "Ding-Dong" was a wonderful name for a missile. Ding-Dong! Rings a bell! A gem of a name, it seemed to us. But now, alas, the Douglas air-to-air bird is merely the MB-1. A great pity, we say.

Watch for Lockheed Air Terminal to pick up more airport consulting work, now that it has demonstrated its staff is equipped to do this type of work by turning out a good job in its first venture—a financial study on the Honolulu airport for the Hawaii Aeronautics Commission. The report has been well received.

No less an authority than Donald W. Douglas himself declares the first DC-8 flight will take place on schedule . . . Courtlandt Gross, Lockheed president, has bought a boat, satisfying an old yearning . . . Pan American has been talking to Boeing about the possibility of taking the 707 prototype to Miami for crew training in advance of actual delivery date of the first airplane.

Barney Coggan, general manager of Convair's San Diego division, reports training costs last year exceeded $1,000,000. Enrollment in training courses totaled 35,344, or about 5,000 above the average employment for the year. Many employes took more than one course. Convair-San Diego has more than 50 instructors working full time on in-plant training.

Genisco, which makes accelerometers for control systems of high speed aircraft and for missiles like the Nike, expects a new accelerometer with a variable transformer-type ac voltage output to exceed eventually the demand for potentiometer models. The ac output accelerometer is said to have advantages of increased life, reliability, resolution and sensitivity . . . Triplett & Barton has delivered its first "Port-A-Lab" X-ray on wheels to Boeing Airplane Co., making possible field examination service with immediate X-ray photos to assess condition of parts . . . Rohr Aircraft has invested $400,000 in a new cafeteria to make its employes happier.

Mark up a point of merit for Bill Bridgeman, the famed Douglas test pilot, for an unpublicized visit to the blind ward at the V.A. hospital in Los Angeles. He never had a more appreciative audience for his story of his adventures in the record D-558s, and the sightless veterans seemed to enjoy by their sense of feel the pressure suit, flight helmet and models of planes he brought along as though they could actually see them. You don't hear so much about Bill these days. Testing operational jets at El Segundo doesn't make headlines like breaking records in rockets, but he's flying as much as ever. And it is nice to be able to note for the record that he can still take the time to do such things as entertain the blind veterans. Nice going, Bill.

Southern California Edison Co. has discovered the military practice of showering the air with strips of aluminum foil to jam radar isn't so good for transmission lines. Short-circuited 13 power lines in a record "air raid."

ENGINEERS...

Let's exchange resumes

NAME:
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POSITION:
World's largest manufacturer of aircraft and missile systems.

LOCATIONS:
Santa Monica, El Segundo and Long Beach, California; Tulsa, Oklahoma; Charlotte, North Carolina.

AGE:
37 years in aircraft; 15 in missiles.

EDUCATION:
An engineering company managed by engineers—such as Donald W. Douglas, B.S., Aeronautical Engineering (M.I.T.); F.W. Conant, B.S., Civil Engineering (Cornell); and A. E. Raymond, B.S., Mechanical Engineering (Harvard), M.S., Aeronautical Engineering (M.I.T.), and Ph.D. (Hon.) (Polytechnic Institute of Brooklyn)—and with key staff positions held by graduate engineers, physicists and mathematicians, many with advanced degrees.

EXPERIENCE:
Holder of many "firsts," such as
—first airplane to carry a pay load equivalent to its own weight. (1920)
—first globe-circling airplane. (1924)

Builder of the famous "DC" series of commercial aircraft.
—every six seconds of each day, a Douglas commercial airplane takes off or lands somewhere in the world.
—currently producing the ocean-spanning DC-7C.
—soon to be in service, the exciting jet-powered DC-8.

Builders of nearly one-sixth of the planes produced in America during World War II.
Currently building even finer transports, jet fighters and bombers.
Pioneer in missile research and production with nine separate projects.

REFERENCES:
Every major airline in the world.
Thousands of manufacturers of components for aircraft and missiles.
The U.S. Army, Navy and Air Force.
Some 80,000 Douglas employees throughout the country.

NIKE I, a radar-guided missile, intercepts bombers at supersonic speeds despite evasive action.

Engineers modify DC-8 configuration in wind tunnel tests for stability and control data.

NAME: _____

POSITION: _____

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ADDRESS: _____

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AGE: _____

EDUCATION: _____

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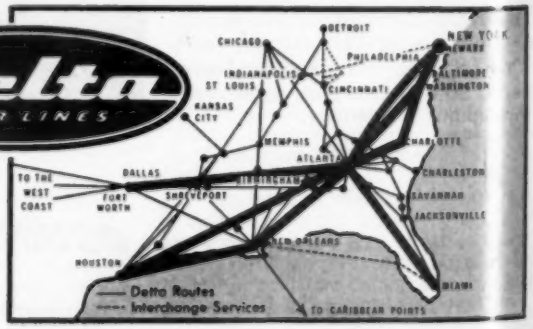

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by Anthony Vandyk

C-46 about to stage major comeback

What is going to be Latin America's DC-3 replacement? Fokker/Fairchild F-27 Friendship, Handley Page Herald, Convair 440? No, the C-46. That's the impression this writer gained after a quick visit to Central America and Latin America's transport aircraft support base—Miami.

The C-46 today appears to be on the verge of staging a major comeback. The majority of Latin American airlines operate C-46s alongside DC-3s and have made them into reliable aircraft without engaging in any major modifications or re-build programs.

Since the last of the 3,180 C-46s was built at the end of World War II, a variety of schemes have been worked up to improve the aircraft. Most of them involved numerous minor modifications and the installation of later versions of the R-2800. These programs, most of which were devised by Miami companies, brought payload increases and boosted the cruising speed from the original 190 mph to up to 230 mph.

Last year the C-46 came into the limelight in the U.S. when Northeast Airlines unexpectedly placed an L. B. Smith-converted C-46 "Commuter" in passenger-carrying service. This was the first time that a scheduled domestic carrier had used a C-46 for passenger-carrying operations. Several months earlier Braniff placed two L. B. Smith-converted "Commuters" in service on all-cargo work.

Curtiss-Wright takes interest

The latest development in the fast-moving C-46 picture is that the aircraft's manufacturer, Curtiss-Wright Corp., has at last taken an interest in its future. Several C-46 operators both in the U.S. and in Latin America have been approached by Curtiss-Wright regarding a proposal to re-engine the transport with the Wright R3350 Turbo Compound.

Curtiss-Wright would like to find an overhaul base that would undertake the conversion program. In addition to re-engining with the Turbo Compound, the program calls for a fuselage extension of 6 feet and strengthening of the wing and the landing gear. The result would be a 250-mph plane grossing up to 52,000 lbs. and carrying at least a ton more than the aircraft's original payload.

While operators are studying the Curtiss-Wright proposals, the market price of the C-46 is going up as demand increases. Delta Air Lines is buying four. Argentina's new private-enterprise Transcontinental Airline has purchased a batch of the L. B. Smith "Commuter" version.

Operators swear by them

In Europe where the C-46 has seen little service, two Swedish operators are acquiring the aircraft. Hitherto the prime scheduled airline user of the C-46 has been the Far East's CAT. Within the U.S. the largest fleets are owned by all-cargo carriers such as The Flying Tiger Line, Riddle Airlines and Slick Airways.

One thing is certain: all these operators swear by the C-46 and would like to keep them in service indefinitely. They were cheap to buy and they're cheap to operate. The C-46 has had a doubtful reputation from the safety standpoint, but the record shows that most of the accidents resulted from bad maintenance and incorrect operation. Since 1954 the C-46's record has been exemplary. The only people who want to replace the C-46 are the new aircraft salesmen.

TAKING OFF from the Paris heliport is one of Sabena's Sikorsky S-58s. The Belgian airline has inaugurated operations between Brussels and the French capital. Flying time from city center to center is under two hours.

BRIEFS

Air France has ordered seven more Boeing 707s bringing its total order to 17 aircraft . . . **Air-India International** plans to start service across the Pacific to San Francisco this summer . . . **British European Airways** plans to start service to Warsaw this summer . . . **Middle East Airlines** will inaugurate a weekly Viscount schedule to Germany on April 16, when the Beirut (Lebanon)—Athens-Vienna route is extended to Frankfurt . . . **SAS** plans to sell its fleet of eight Saab Scandias. Among operators who have shown interest is Brazil's **VASP** airline, which already operates a fleet of 9 Scandias.

Lufthansa has postponed its program to introduce service to Cairo due to the political situation in the Middle East. On April 28 it will open a Frankfurt-Zurich service . . . **El Al Israel Airlines** aims to start operations with Britannia equipment on its Israel-New York route in July.

Finland's **Valmet** company plans to build 20 Folland Gnat lightweight fighters under license for the Finnish Air Force. Finland is also buying 12 aircraft from the British manufacturer . . . **Westland Aircraft Ltd.** is currently installing a Napier Gazelle free-turbine power plant in a Wessex (S-58 license) helicopter . . . **Hindustan Aircraft** now has in quantity production the first Indian-designed aircraft, the HT-2 piston-engined basic trainer . . . The British government has withdrawn its support for the **de Havilland** Gyron, a turbojet which is at present running, with afterburning, at 25,000 lbs. thrust . . . Procurement policy for the **Bristol** Olympus B016 is being re-examined by the British government. Following successful type test at 16,000 lbs. static thrust and the change in Minister of Supply, a recommendation has been made to the Treasury that funds be made available both for production and for development to the engine's full potential—believed to be in excess of 20,000 lbs. dry thrust . . . West Germany has ordered 50 **Bristol 171** Mk 14 Sycamore helicopters . . . **Shin Mitsubishi** has been studying a program to build 300 North American F-100D fighters under license for the Japanese Air Force starting in 1958 and continuing through 1960 . . .

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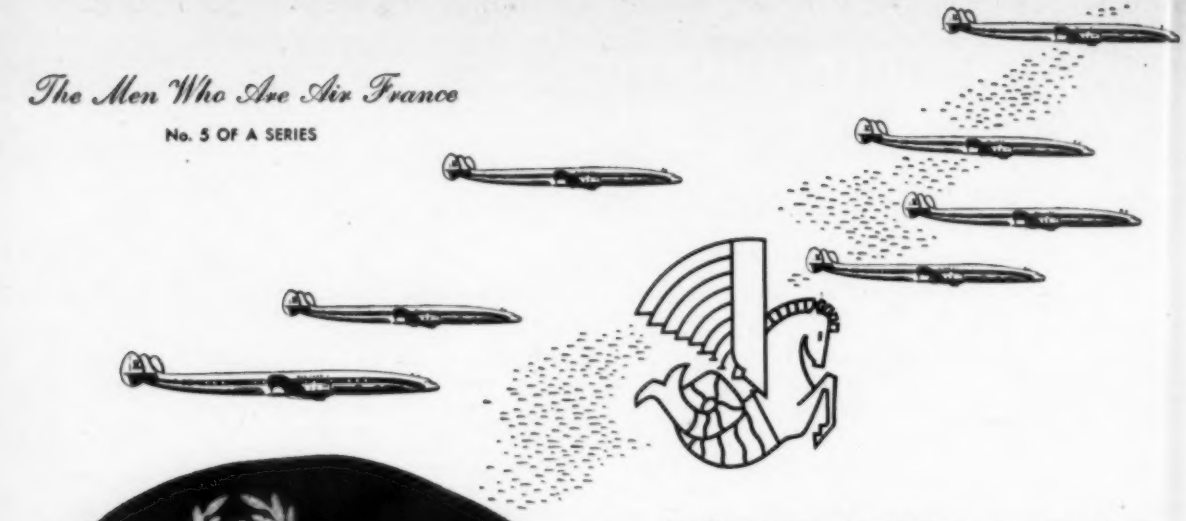

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Circle No. 166 on Reader Service Card.

How Cubana is pulling out of the red

Flying night club, addition of modern equipment, opening of N. Y.-Havana route all helped

by Anthony Vandyk

HAVANA—When a night club act complete with drums and piano became a regular feature of the Thursday evening flight from Miami, Cubana's competitors shook their heads.

"If Cubana has to do this sort of thing, the end can't be far away," they said. They had been watching Cubana's fortunes rise and fall—usually fall—since the company shed its association with Pan American World Airways in 1954.

By virtue of what some Cuban airline officials call its "emancipation," Cubana was left with no sales organization overseas, little in the way of maintenance facilities and no modern aircraft. This was because from 1932 to 1945 Cubana was a wholly-owned subsidiary of PAA. Sales outside of Cuba were handled by PAA's worldwide sales organization. Major overhaul work was handled at PAA's well-equipped bases in the U.S.

In 1945 some of Cubana's stock was sold to Cuban investors but the basic relationship with PAA remained. Long-haul aircraft were leased from PAA to start a route to Europe. So in July 1954, when the remaining 20% of the stock controlled by PAA in Cubana was sold to Cubans, the airline had very little except headaches.

Without PAA to sell the route, Cubana's traffic between Miami and Havana slumped. Lack of equipment produced serious delays on all international routes. The cumulative result was that Cubana was heavily in the red for its first two years of independent operations. In 1954 the figure was over $2 million while in 1955 it was nearly $3 million.

The tide turned in 1956 and it is expected that when final figures have been computed the loss will be only slightly more than $500,000. A profit is confidently expected for 1957.

Cubana's transition from one of the lower-ranking Latin American airlines to one of the most highly respected carriers in the Caribbean was due to a combination of factors. Firstly, a new promotion-minded management headed by Juan Palli, 33-year-old vice president and general manager. Secondly, the acquisition of modern, competitive equipment—Viscounts and Super-G Constellations. And thirdly, the inauguration less than a year ago of the Havana-New York route.

The introduction of the flying night club on the Miami-Havana run last year was an example of Cubana's promotion-mindedness. At the time the company was operating L-49 Constellations on the route and loads were pathetically low. Palli says: "If we had more than 15 on one of the planes we were doing well and if there were more than 20 it was phenomenal." Something had to be done to boost load factors.

The management was discussing this problem when Palli said jokingly, "Why don't we put the Tropicana Night Club aboard to bring in passengers." "Well, why don't we?" one of his aides replied. A quick check was made and it was found that the Tropicana, Havana's world-famous night club, could provide top artists and that there would be no difficulty in fitting a piano in the front of the Constellation.

"At that time if we had ripped out half the seats and filled the other half due to the night-club act attraction, we would have been doing far better than previously," Palli said.

MAMBO DANCERS and band from Havana's Tropicana night club were introduced as a regular feature of Cubana's Thursday evening Miami-Havana flight as a gimmick to boost traffic prior to the introduction of Viscounts on the route. Note piano in rear.

Why Viscounts

Named "The Tropicana Express," the flying night club rapidly became a success and drew attention from all over the U.S. It served its purpose in acting as a promotion gimmick for Cubana, boosting traffic until delivery had been taken of Viscounts for the Miami route.

The decision to buy Viscounts was taken by Cubana's management after consideration of all other types of aircraft. The company was faced with acute competition from PAA's and National's DC-6Bs and Convairs and the only way to compete seemed to be to acquire a completely different type of aircraft. Cubana even consulted with a U.S. manufacturer and that company agreed that the Viscount was the only solution for the Cuban airline.

It was easier to decide to buy Viscounts than to get delivery. When the Cubana decision was taken new aircraft could be delivered only two years after the order was placed. That wasn't quick enough for Cubana so a check was made to see whether any other operator might have some Viscounts that it didn't want.

By a great stroke of fortune a British independent airline, Airwork, had just decided to sell the three Viscounts that were due to be delivered to it in a few months. The reason: the British government had refused to allow Air-

work to operate the turboprop aircraft on its "colonial coach" services from England to Africa. The aircraft were therefore left available and Cubana was able to buy them. It had to pay a stiff premium (reportedly $1 million for the three planes).

Cubana started Viscount operations last August and immediately its Havana-Miami traffic started to boom. It now operates six roundtrips daily over the route and has succeeded in diverting considerable traffic from National and PAA. It is getting a daily utilization of 5¾ hours out of each of its three Viscounts, which operate on the domestic Havana-Santiago route as well as on the Miami run.

When the four Viscount 800s on order are delivered to Cubana the present Viscount 700s will go on to more domestic routes. Since Cubana started Viscount operations there have been no mechanical troubles whatsoever in the airframe and only two premature engine withdrawals. At present the aircraft's Rolls-Royce Dart engine has a 725-hour life but this will soon be increased to 1,000 hours. Both the removals, incidentally, were of a minor character and were covered by the guarantee of the manufacturer. One was caused by a stone in the turbine.

The Darts are now being overhauled by Capital Airlines in Washington but by the end of the year Cubana will do the work itself. It is already doing all airframe overhaul on the Viscount.

Cubana to train others

Cubana's shops are doing such a good job on the Viscount that Lloyd Aereo Colombiano has selected them to perform its Viscount overhauls. Cubana will also train this carrier's crews. Several other Latin American airlines are also planning to have their Viscounts overhauled by Cubana and their crews trained by the line.

Because of Cubana's happy experience with the Darts in its Viscounts the airline is seriously considering the Fokker/Fairchild F-27 Friendship as a replacement for its DC-3s. Cubana has an extensive domestic route network and since Cuba, unlike many Latin American nations, has night flying facilities at several domestic airports, exceptionally fine service can be provided.

Each domestic flight is named ("El Libertador," "El Titan," etc.). This writer made a series of flights on the domestic routes of Cubana and was impressed by the on-time performance of the operation.

Surface transportation good

There are several problems, however. One is that surface communications in Cuba are generally very good. Air conditioned toilet-equipped buses operate high-speed services at fares well below airline level (4½¢ per mile). Rail communications within the country are also good. Consequently, Cubana has to fight hard for its domestic passengers.

It is only in the far east of Cuba that surface communications are poor and that the airline provides the only reliable form of transportation. Only to these inaccessible parts of Cuba does Cubana carry any sizeable volume of cargo and mail traffic.

Cubana has six DC-3s for domestic operations and the international service to Port au Prince, Haiti, and gets a daily utilization of nine hours out of each. The company has been overhauling its DC-3s since 1947 and the aircraft's R-1830 engines since 1945.

Cubana's biggest aircraft is the Lockheed L-1049G Super Constellation. It has two of these and a third is on order. The Curtiss-Wright R-3350 turbo compound engines are overhauled by PAA in Miami. These engines have run to their full overhaul life of 1,600 hrs.

Up to now all airframe work on the Super Connies has been handled by Cubana but when the 5,000-hour overhauls become due the aircraft will be sent to a maintenance base outside the country. Cubana, however, hopes eventually to be able to perform all Super Connie overhaul work.

The reliability and passenger appeal of the Super Connie have been largely responsible for the success of Cubana's mixed-class daily service to New York, started last year. Traffic on this route has far exceeded expectations. One reason for this is the superlative service aboard.

Cubana advertises "the most superb tourist class service in the air" for this route. It provides lavish complimentary meals for tourist passengers plus snacks and alcoholic beverages priced at only 50¢, except for beer, which is provided free.

On certain flights a bingo game is organized for passengers—another of the unusual gimmicks of Cubana. Super Constellations are used on the Havana-Mexico City run and on the weekly service to Europe as well as on the New York service.

During the winter season the route to Europe is operated in pool with Iberia, which also flies Super Constellations between Havana and Madrid. Cubana generally favors pooling its operations with carriers operating reciprocal services but has found little enthusiasm for such practice from its U.S. competitors.

Ambitions for future

Cubana's plans for the future mainly involve additional service to the United States. It would like to operate nonstop from Havana to Los Angeles and possibly use San Francisco as a co-terminal. It would also like authorization to operate its Havana-New York route via Washington.

Furthermore, Cubana is interested in operating to Europe via New York and extending its service to Canada. At the U.S.-Cuban bilateral talks early this year many of these plans were discussed but no agreement was reached.

Until the Cuban government agrees to allow a U.S. carrier to fly from Key West to Havana—a route currently monopolized by Cuban airline, Aerovias Q—it is unlikely that the U.S. will allow Cubana to extend its operations.

Like all other international carriers Cubana is worried about equipment for the 1960s. It would like to order jets but is not sure that several of the airports it serves will be suitable for these aircraft. Consequently it is seriously studying the acquisition of a big turboprop as an intermediate step prior to the acquisition of jets.

Now in its 32nd year, Cubana today is undoubtedly one of the most dynamic Latin American airlines. Last year it carried over 240,000 passengers. Its annual payroll for its 750 employees (including 100 pilots) is in excess of $2.5 million.

CUBANA'S ROUTES extend from Mexico City to Madrid and from Port au Prince, Haiti, to New York. No other Caribbean island nation has an airline with such a large system. Cubana also operates a dense network of domestic routes.

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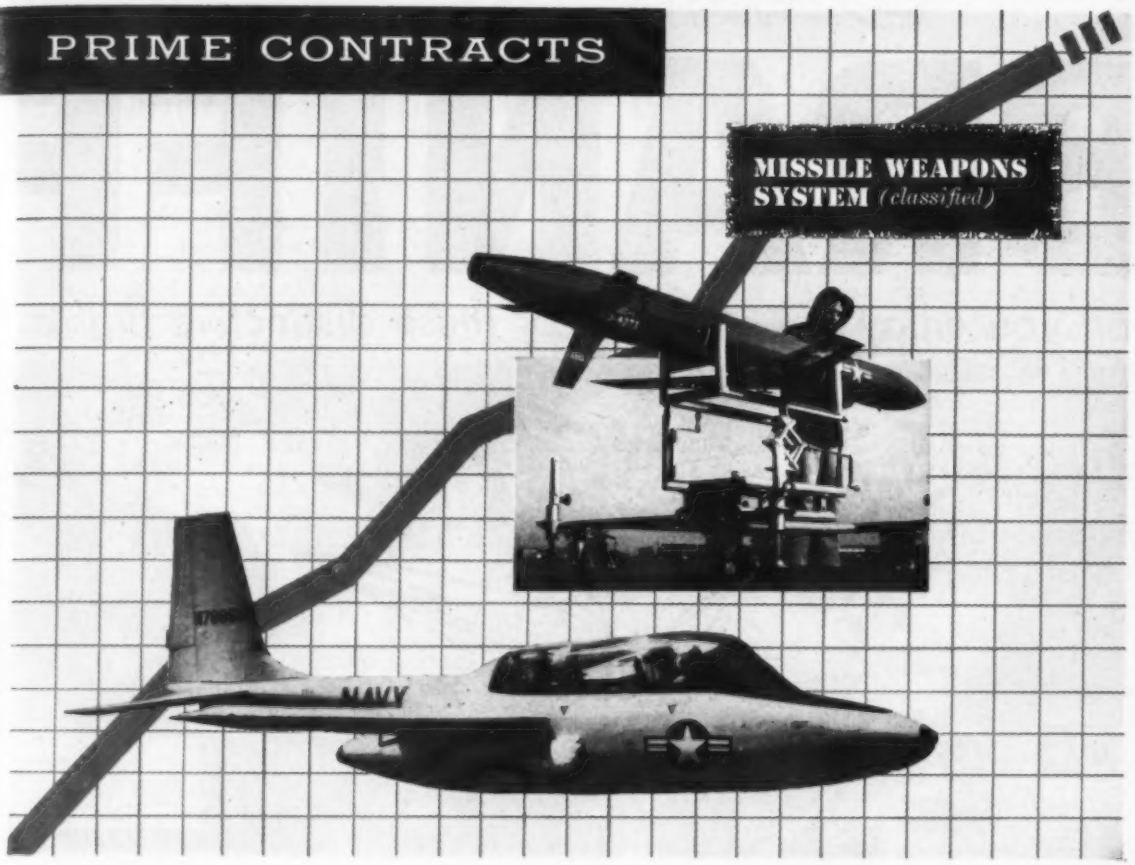

At Temco GROWTH tells the story

Growth — in prime contracts earned, for example, tells the Temco success story.

In January, Temco announced its third prime contract from the U. S. Navy within a seven-month period. This 16-million-dollar order, for a classified guided missile weapons system, is another Temco engineering accomplishment, another advance in the company's rapid growth as a prime contractor.

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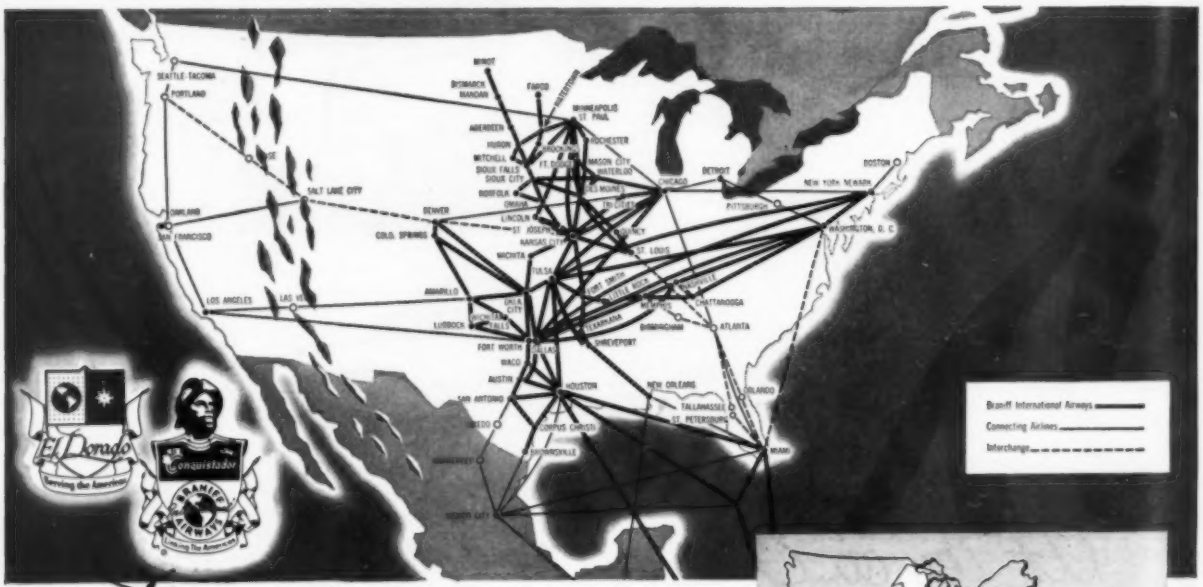

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Board launches sweeping probe of PAA finances

by William V. Henzey

CIVIL AERONAUTICS BOARD this month launched a sweeping investigation of the financial relationships among Pan American World Airways and some 27 affiliated companies. The action stemmed directly from a report by CAB auditors which challenged PAA bookkeeping practices and, consequently, subsidies paid PAA by the U.S. Government.

The new investigation was described as the broadest of its kind involving one company since CAB was established in 1938. The controversial, and still confidential, auditors' report covered the year 1954 and was the first simultaneous audit of PAA's four divisions. Although touched off by that report, the new CAB investigation is not limited to any specific year.

In announcing the probe, CAB invoked seven sections of the Act and said it believes "that a broad review . . . should be instituted to determine:

"Whether all agreements (involving Pan Am and affiliates) subject to the Board's jurisdiction have been filed with the Board;

"Whether such agreements are sufficiently specific to govern the proper distribution of revenues and expenses among Pan American and Affiliates;

"Whether the terms of such agreements are being carried out;

"Whether any such agreements are adverse to the public interest or in violation of the Act; and

"Whether sections 408 and 409 relationships have been used, insofar as they affect financial transactions among Pan American and Affiliates, in a manner adverse to the public interest."

CAB outlines its aims

Also, CAB said: "We wish to consider, in the large, the total effects of the numerous and complex financial inter-relationships. We wish also to consider the adequacy of the accounting and reporting provisions attached to our previous approvals of various section 412 agreements and section 408 and 409 relationships. In addition, we wish to study generally Pan American's accounting and reporting practices with respect to transactions between Pan American and Affiliates.

"Our broad review will encompass past and present financial agreements, arrangements, transactions, practices and sections 408 and 409 relationships among Pan American and Affiliates. . . . We believe, further, that this investigation should include a broad review of the management and financial aspects of the relationships between Pan American and the other (non-air carrier) businesses listed . . . insofar as such relationships bear upon the operations and financial results of Pan American. . . ."

The action against Pan Am has been building up for several years. Last year, Comptroller General Joseph Campbell reported to a Congressional committee that Pan Am has received over $200 million in Federal subsidies since 1946. Campbell, whose auditors in the General Accounting Office examine the findings of CAB auditors, reported on the Pan Am situation this way:

"We recognize that there are areas in the parent-subsidiary relationship where something less than arm's-length status could obtain. Described simply, these would be, among others, where the parent is not receiving its full costs with a reasonable profit from its purchases for and services to its subsidiaries and, conversely, where the subsidiary is permitted to overcharge for its services to the parent.

"In this connection, we have reviewed the relationships between Pan American and one of its associated foreign companies. Although Pan American appears to have less than majority stock control in this associate, the facts indicate that it wholly controls the ground servicing operations, and related financing and accounting.

"The associate performs primarily ground services for Pan American and for several of the latter's subsidiaries . . . Billings are made to the parent and rebilled to the subsidiaries. We were unsuccessful in obtaining information from the carrier as to whether Pan American rebilled the charges in the same amounts."

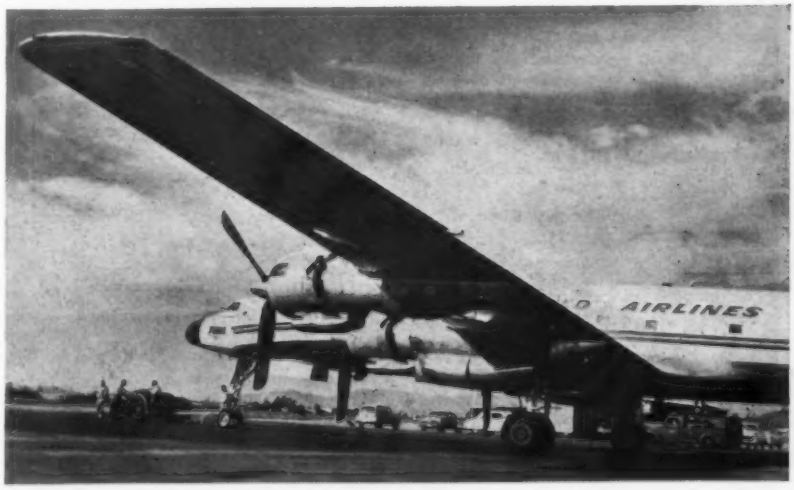
Campbell emphasized the "hope that the current audit by the Board will provide more information on the financial relationships between the carrier and its foreign affiliates and associates."

In what could well turn out to be prologue to the CAB auditors report, Campbell then listed the following as "major areas" for CAB scrutiny:

"1. *It is possible* for subsidiaries to retain earnings until the subsidized carrier is on a final rate. Any distribution of dividends to the carrier during a final rate period would not be subject to application toward the reduction of the carrier's need for government subsidy.

"2. *A carrier's equity* in subsidiaries may be several times the acquisition cost of the stock investment, which may result in substantial potential income to the carrier. Here again, if any or all of the investments were liquidated during a final rate period, the gains would not be offset against the carrier's need.

"In the case of Pan American, its reported stock investments in affiliated



Bigger wings to join TWA fleet

UNDER-WING PHOTO of the first Trans World Airlines Lockheed 1649A Jetstream Constellation. TWA has 25 of these 6,300-mi. range transports on order. Span of new wing is 150 feet—27 feet longer than any previous Lockheed Aircraft transport.

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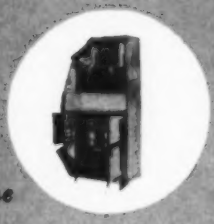

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and associated companies at December 31, 1955, totaled $11,456,000 while its estimated equity, based on their book values, was $25,900,000. The amounts at December 31, 1953, were $6,697,000 and $18 million, respectively. The market value of these investments are not known.

"3. *Joint facilities* charges to the air carrier, and any other charges determined by allocations of expenses, might contain a disproportionate share of total expenses.

"4. *Charges to subsidiaries* for maintenance and overhaul work, pilot training, technical assistance, lease of aircraft, sales of aircraft and equipment, and for all other services performed by the parent company could be more favorable to the subsidiaries than sound business practices might warrant."

And a year before Campbell's testimony, Senator Paul H. Douglas (D-Ill.) led a bitter but unsuccessful fight against CAB subsidies to Pan Am for fiscal year 1956. Basis for Douglas' fight was the fact that the Government admittedly knew little or nothing about the books of Pan Am subsidiaries.

Douglas focused on one of PAA's non-air carrier affiliates, Intercontinental Hotels Corp. On the Senate floor, he said: ". . . it will be found that Pan American incurred a deficit of $2,530,000 on IHC for 1953. The record seems to indicate that this became an expenditure of Pan American . . . I should like to remark that what seems to be happening is that we are subsidizing Pan American, which in turn is subsidizing its wholly-owned hotel corporation."

Still earlier, December 20, 1954 to be exact, an investigating team of the House Appropriations Committee reported that "the Civil Aeronautics Board does not have accurate facts or figures regarding Pan American operations. Most of the subsidiaries have never been properly audited and some not at all. . . . If corrective action were taken, substantial cuts in subsidy should result."

Probe exploratory—at present

CAB has lodged no charges against Pan American and the new investigation, initially at least, is an exploratory economic proceeding. If no violations are turned up, it would presumably clear the air once and for all as far as transactions between PAA and its affiliates are concerned. If violations are uncovered, the above quotations would more than likely indicate their approximate nature.

Significant in the CAB action is the fact that it invoked a rarely-resorted-to section of the Act dealing with "Inquiry into Air Carrier Management." It provides that CAB is "empowered to inquire into the management of the business of any air carrier and, to the extent reasonably necessary for any such inquiry, to obtain from such carrier, and from any persons controlling or controlled by, or under common control with, such air carrier, full and complete reports and other information."

Meanwhile, the agency, which soon will announce procedural steps in the probe, has ordered Pan Am to "preserve and refrain from destroying or removing from its possession . . . until further order of the Board, all accounts, records, and memoranda, including all documents, papers and correspondence, now or hereafter existing and now or hereafter in its possession, relating to agreements, arrangements, transactions, practices, and . . . relationships among Pan American and Affiliates, irrespective of whether such materials are those of Pan American or of affiliates or of other persons."

Mohawk uses photos to qualify pilots

Mohawk Airlines is using color slides to qualify pilots at new airports, believed to be the first application of aerial photography to such qualification by local service airlines.

Mohawk is using the slides to prepare its pilots for operations at two airports—Erie, Pa., and Detroit. The slides include runways as seen from the ground showing obstructions on takeoff, each runway from one mile out at 1,000 ft., showing landing obstructions, and the entire airport layout from 4,500 ft.

Previously CAA required that a pilot seeking qualification at an airport actually fly the run and make an approach and landing accompanied by a pilot already qualified. In 1955 CAA approved a one-year trial with the slides, and last fall it extended that approval.

Braniff to use Collins integrated flight system

Braniff International Airways will equip its jet and turboprop aircraft with Collins' newest flight director system and its Douglas DC-7C fleet with RCA weather radar systems.

Braniff's five Boeing 707s and nine Lockheed Electras will have Collins Radio Co.'s FD-105 Integrated Flight System. The advanced four-inch version of Collins' original IFS provides a pictorial indication of flight attitude and position on two instruments.

The DC-7C's are being fitted with RCA AVQ-10 weather radar equipment and will begin service on Braniff's domestic routes early this summer.

Five U. S. airlines and 13 foreign carriers are operating with RCA system or have ordered it. They are: American, Continental, Pan American, TWA, United, Air France, Air India, BOAC, CMA, Cubana, Iberia, Qantas, REAL, SABENA, Swissair, UAT, Karhumaki (Finland) Airways and Thai (Thailand) Airways.

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Higher oil prices milk airline profits

by Joseph S. Murphy

THE RECENT 35¢-a-barrel increase in crude oil prices, touched off by the prolonged Suez crisis, is wreaking havoc in the expense column of airline balance sheets.

This seemingly small price hike, which amounts to a 1¢ to 1¼¢ per gallon in delivered fuel, is expected to swell the avgas bills of U.S. scheduled airlines an estimated $15 million this year alone. It affects all types of operations—domestic, international and local service—and piston as well as turbine-powered aircraft.

And the airlines are not alone in their plight. Defense Department officials say their $350-million avgas and jet fuel bill of fiscal 1956 already has been increased by 4.6% this year—may reach 6% by June 30. This would add up to a $21-million overall jump in fiscal 1957.

Three major domestic carriers alone will account for almost half of the $15 million extra the commercial airlines will pay, an American Aviation survey shows.

American Airlines president C. R. Smith estimates AA's bill will run $1,980,000 higher, about a 6.75% jump. United Air Lines officials figure the price hike will raise 1957 avgas costs about $2.1 million. An unnamed third airline pegs its increase between $2.5 and $3.25 million, resulting from an average 1¢ to 1¼¢ per gallon advance.

Trans World Airlines, which includes both domestic and international service, will pay $3.5 million more for avgas this year, the survey shows. At Capital Airlines, kerosene-type fuels for Viscount turboprops bear the impact on an equal basis with avgas, boosting fuel expenses nearly $1 million.

In the local service field, Allegheny Airlines, for example, is hit with the same 5% to 6% rise. Based on its $1,058,000 avgas bill last year and assuming a normal increase in traffic this year, the price hike will add $60,000 in the expense column.

Reason for the variation from one airline to another is the difference in their basic fuel contracts. Some agreements are tied to crude oil prices, others to automotive gasoline.

Generally speaking, a 5¢ per barrel increase in crude means a $0.002 per gallon hike for the carriers. For those tied to automotive gasoline, avgas costs increase or decrease penny-for-penny per gallon as auto fuel prices change.

The recent price boosts were touched off in November when crude in California advanced 35¢ a barrel. Shortly thereafter, East Texas crude, the most widely used, jumped 35¢. Oklahoma and Kansas prices advanced 25¢ a barrel almost simultaneously.

And with the majority of airline contracts tied to prices at one or more of these points, the effect has been widespread. But what makes its impact probably the greatest yet felt by carriers for a single cost item is the timing.

For one, the fuel price increase is the first since 1953 and airline flying, which goes hand in hand with fuel consumption, has jumped 26% from 666.1-million to 838.6-million plane miles annually since then.

Furthermore, it hits at a time when carriers are battling to hold cost increases at a level below that of revenue gains. But with fuel costs accounting for a rule-of-thumb 15¢ out of every dollar spent, a 5-to-6% increase in this single cost item promises to dip deeply into profits.

This is particularly true as the continuing trend toward increased coach services reduces an airline's average return per passenger mile, yet until cost for an item such as fuel increases equally for first-class and coach service.

One factor in the timing of the price hike, however, may work in the airline's favor. Coming at a crucial period when CAB undertakes its general fare investigation aimed at slicing, not increasing, the price of airline tickets, it points up sharply the need for recognizing current trends and not only history in shaping such decisions.

But whatever the outcome of the CAB investigation, the avgas increase has forced airlines to act. In the short period since it went into effect six carriers have filed with the Board for a 6% fare increase, and in virtually every instance have increased avgas costs.

Avgas cost trends

U.S. Domestic Airlines

Here's how combined avgas and engine oil costs have spiralled in postwar period compared with Bureau of Labor Statistics wholesale price index, according to Air Transport Assn. Effect of recent price change would not be reflected until end of 1957.

Year	Composite Fuel/Oil Cost Cents/Gals.	Index*	BLS Index* of Wholesale Prices
1947	14.0	85	95
1948	17.4	105	103
1949	18.3	111	101
1950	18.6	112	105
1951	19.0	115	116
1952	19.5	118	113
1953	20.3	123	114
1954	20.3	123	115
1955	20.0	121	117

* 1947-1949=100

Six locals setting up new organization

The Conference of Local Airlines has been reduced from 13 to seven members and the six resigning carriers are in the process of forming their own organization.

The six lines—Frontier, Ozark, Bonanza, West Coast, Central and Lake Central—left the Conference because of basic differences over how the organization should operate and how certain local service problems should be pursued.

The Conference this month waived the provision of its articles of association providing for a six-months' notice of withdrawal and accepted "with regret" the resignations of the six, effective immediately.

Remaining members—Allegheny, Mohawk, Piedmont, North Central, Southern Southwest and Trans-Texas—confirmed their intention to continue the Conference's operations.

"The members agreed that the Conference would continue to press vigorously for solutions of the questions of the earnings level of the local . . . carriers, the retention of capital gains realized on the sale of flight equipment, the pending CAB investigation of passenger fare levels, and other subjects of special interest to the local carriers," the Conference said.

"They further confirmed their intention of continuing to press ahead on these fronts within the framework of the machinery set up by the Congress to solve the problems of the air transport industry, namely the CAB, and they reiterated their confidence in the Board's expressed intention, jointly with the carriers, to consider those problems.

John H. Connolly, president of Southwest, was elected to the Conference's board of directors, and the size of the board was reduced from six to three. Other directors are Les Barnes, Allegheny, and Earl McKaughan, Trans-Texas.

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Cuzco, Peru, was capital of the amazing Inca Empire's early civilization. This cathedral is built on a foundation of artistic Inca stonework. Young man with horn, at top, is calling townfolk to church.

Here's what U.S.-Mexico bilateral means

by Eric Bramley

The question of which U.S. airlines will operate two important routes between the U.S. and Mexico was brought into sharp focus this month with the signing of a civil air agreement between the two nations.

The signing, which broke an 11-year impasse, was followed by a statement from President Eisenhower overruling former President Harry S. Truman and reinstating three certificates of U.S. airlines to serve Mexico.

This development, however, did not settle the question of who will fly two vital routes: New York-Mexico City, and Chicago-Mexico City.

Under the agreement, which becomes effective June 5, the U.S. was granted the following routes: New York, Washington-Mexico City; Chicago, Dallas, San Antonio-Mexico City via intermediate points in the U.S.; New Orleans-Mexico City; Los Angeles-Mexico City via U.S. intermediates; New Orleans-Merida, Mex., and beyond, to Guatemala, and beyond; Miami-Merida, and beyond, to Guatemala, and beyond; Houston, Brownsville-Tampico, Mexico City, Tapachula, Mex., and beyond, to Guatemala, and beyond. The last three routes are presently operated by Pan American World Airways.

Mexico received: Mexico City-Washington, New York; Mexico City-Chicago via Mexican intermediates; Mexico City-Los Angeles via Mexican intermediates; Mexico City-New Orleans via Mexican intermediates; Mexico City-Miami, and beyond, via Mexican intermediates; Mexico City-San Antonio, via Mexican intermediates. A seventh route was described as "pending."

An airline designated by either country may, at its discretion, omit stops on any of the routes specified on any or all flights.

In 1946, CAB certificated Western Air Lines for Los Angeles-Mexico City, Eastern for New Orleans-Mexico City, and Braniff for San Antonio/Laredo, Tex.-Monterrey-Mexico City. Necessary approval was given by President Truman. Because of the absence of a civil air agreement, the routes were never flown.

Six years later, Truman withdrew his approval, asserting that "as long as there is no . . . air agreement with Mexico and these inoperative certificates remain outstanding, a government other than our own will have the sole voice as to which, if, and under what conditions, any of these services will be initiated."

However, President Eisenhower said after signing of the agreement that in 1953 the Attorney General advised him that "the purported termination in 1952 of the certificates . . . did not comply with the statutory procedures prescribed by Congress, and hence was ineffective."

The U.S., he added, must be "in a position to take immediate advantage of the rights secured to us under that agreement. Accordingly, on advice of the Attorney General, I am recognizing the validity of the certificates issued in 1946, and hereby approve them, and determine that they stand unrevoked."

This action will mean that Western will be able to open the Los Angeles-Mexico City route, on which Compania Mexicana de Aviacion (CMA) has enjoyed a monopoly. Likewise, Eastern can start New Orleans-Mexico City.

But New York-Mexico City is not yet settled. American Airlines can operate between the points, but must stop at Dallas/Ft. Worth. Air France, with nonstop rights, has taken almost all the traffic on the route.

A year and a half ago, CAB held hearings to determine which U.S. airline—American, Pan American or Eastern—should have nonstop rights. In the absence of an air agreement, the case was shelved. Further hearings—in executive session—may now be necessary to look into certain "alleged improper air carrier activities on the part of the applicants." Eastern had charged AA and PAA with "obstructionist tactics" and requested any confidential CAB and State Department files which might shed light on such tactics.

Two lines seek Chicago rights

At least two carriers—AA and Braniff—are fighting for Chicago-Mexico City rights. AA now flies the route with a stop at Dallas. Braniff's domestic route now serves Chicago-San Antonio and the company is certificated for San Antonio-Mexico City. Braniff has formally asked CAB to designate it as the U.S. carrier on the route.

The U.S.-Mexican agreement is unusual in several respects:

1. *A formal bilateral was not signed.* The agreement, described as "provisional," was effected through an exchange of notes.

2. *The agreement terminates June 30, 1959.* Upon request of either government, prior to May 30, 1959, talks may be initiated "to reach an agreement concerning a system to regulate air transport between the two countries subsequent to June 30, 1959." Asked about the early expiration date, a State Dept. spokesman said: "We're not

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quite certain or sure that it's going to work. It may be found that the agreement will need revision."

3. *Both parties agree* not to designate, for the present, more than one airline for each route.

The 11-year impasse in U.S.-Mexican negotiations was caused principally by the fear of the Mexicans that their airlines would not be able to compete with the stronger U.S. carriers. For this reason, Mexico had insisted that any agreement must contain provisions predetermining frequencies and capacities on the routes. The U.S. has never accepted "predetermination" in any agreement, insisting that frequency and capacity should be decided by airline managements.

This roadblock was removed last month when the two nations agreed to the limitation of one airline for each route.

Burgess changes lineup of TWA management

In his first major organizational move since assuming the presidency of TWA, Carter L. Burgess announced a repositioning of key executives of top-level and divisional staffs.

The changes, effective immediately, divide TWA's system activities along domestic and international lines, instead of four basic divisions.

Frank E. Busch, v.p.-operations, moves to New York, and George Clay, former v.p. and secretary, becomes v.p.-administrative services in Kansas City. Ronald Duckworth moves from assistant treasurer to secretary; W. E. Rooker from general auditor to assistant treasurer, and James J. Feeney from director-industrial relations to assistant v.p.-industrial relations.

Heading the new operations set-up is Floyd D. Hall as general manager-U.S. operations, based in Kansas City, and W. L. Trimble, general manager-international operations, based in Paris. Former western, central, Atlantic and overseas regions are absorbed under Hall and Trimble, who report to Busch along with R. M. Dunn, v.p.-maintenance and stores.

Four-man staff under Busch in New York includes E. J. Minser, system staff director-ground operations services; J. W. Allen, director-operations budget; C. E. Williams, system staff director-operations administration, and F. L. Austin, system staff director-flight operations services.

Reporting to Hall are E. P. Burke, deputy general manager-U.S. operations and system director of flight planning; R. C. Downing, system manager-flight training; and R. B. Mueller, system manager-flight services, all in Kansas City. Also, J. S. Bartles, director-flight operations west, in Los Angeles, and C. R. Springer, director-flight operations east, in New York.

Reporting to Trimble are R. S. Roda, deputy general manager-international operations and director of international ground operations, and Ormond Gove, director-flight operations Atlantic.

Under Dunn are J. T. Davis, system director-field maintenance; J. A. Shaunty, system director-stores, and A. E. Jordan, director-overhaul base.

Catalina Airlines orders 2 Frye F-1s, options 2

Catalina Airlines has ordered two Frye F-1 transports and has an option on two more.

Frye reports that 20 of the aircraft are on order. Customers are: Cruizeiro do Sol of Brazil, 10; Northern Consolidated Airlines, 3 (2 more on option); Wien Alaska Airlines, 3, and Samoan Airlines, Ltd., 2.

Grumman Aircraft was scheduled to build the F-1s under an option agreement due to terminate March 24 unless the Frye Corp. raised $15 million in capital.

Lockheed 1049H Super Connie in Resort markings

RESORT AIRLINES is scheduled to get the first of two Lockheed 1049H passenger/cargo Super Constellations in May. Second will be delivered in June.

"There must be some way to beat this static!"

There is! If this aircraft were equipped with a Hoover 10018 Interference Blanker, the pilot could read the tower loud and clear despite the precipitation "noise" which is now crippling his radio reception. He would get reliable reception under adverse conditions—when he needs it the most.

Extensive tests of this unit by military and our own laboratories demonstrate remarkable communication improvement in the presence of the impulse static normally encountered in modern high altitude, high-speed aircraft.

The Hoover Interference Blanker—compact in a ¼ ATR package weighing 9 pounds and using either 28 VDC or 115 VAC prime power—markedly increases the performance and reliability of your vital electronic navigation, direction finding or communication equipment. For complete engineering information, write to Department B-1.

Attention Engineers

Hoover Electronics offers you a unique opportunity to work in a wholesome environment that enables you to exploit your creative talents and help you grow in your profession. Write to Personnel Director.

HOOVER ELECTRONICS COMPANY
3640 WOODLAND AVENUE
BALTIMORE 15, MD.
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Circle No. 171 on Reader Service Card.

TRANSPORT COMMENTARY

Wrong-way ad right for customer

by Eric Bramley

It may interest you to know that Bonanza Air Lines is publishing an ad upside down in the April issue of Official Airline Guide. Bill Mitchell, BAL's vice president-sales, says it's for the "convenience of the customer on the other side of the counter. Our research has shown that 45% of the time OAG is used, some anxious traveler is on the other side of the book trying to follow the agent's routing. We're just trying to take advantage of this reading audience." But BAL isn't neglecting the opportunity to expose agents to its promotional advertising. Another ad is reproduced for them—right side up.

* * *

A news item that was undoubtedly picked up by airline sales departments was the announcement that the Brooklyn Dodgers baseball team has bought the Los Angeles franchise. Speculation is that the Dodgers will move west within the next few years. If this comes to pass, baseball schedules will have to be based on air transportation. Result will be substantial revenue for the airlines. We have a hunch that some carriers have already contacted the ball clubs to line up the business.

* * *

Interesting commentary on the increased range of airplanes is the announcement that the Dutch will open a freeport at Schiphol Airport, Amsterdam, on April 15. The freeport at Shannon, Ireland, has for years been eagerly visited by trans-Atlantic passengers in search of duty-free goods. But long-range aircraft no longer have to stop at Shannon, so the Dutch are opening their own freeport. And that good Dutch gin—which sells for about $6 a fifth in New York—will be available at $1 per bottle.

* * *

There's been quite a turnover in the CAA Administrator's job during the past several years. Jim Pyle, current holder of the post, jokes about this. The Administrator's office in Washington isn't referred to as the "ivory tower," he says. "It's called 'skid row' because nobody stays there very long," he explains.

* * *

Twenty-five years ago, on April 10, 1932, Art Woodley, a rough and ready bush pilot, started flying a single-engine Bellanca out of Anchorage, Alaska. This small operation was known as Woodley Airways. It was the start of what is now Pacific Northern Airlines, which not only flies intra-Alaskan routes but also serves the U.S.-Alaska market. We've toured the PNA system, and it's a fine airline. Our heartiest congratulations to Art Woodley—who's still at the helm—and PNA on this silver anniversary.

UNITED AIR LINES' mechanic David Adler has 6,500 hours in the pilot's seat of large transport aircraft—but he's never taken a plane off the ground. His job is to taxi aircraft between maintenance hangar and terminal at San Francisco International Airport.

Sales, Traffic and Promotion

Eye-catching direct-mail piece by **Piedmont Airlines** asks question: "What is the highest mountain east of the Rockies?" The answer, which we didn't know until now, is Mount Mitchell (6,684 ft.) in western North Carolina. Naturally it's "in the seven-state region served by Piedmont" . . .

Recommended reading for all sales managers is March 1 special edition published by **Sales Management** magazine. It's devoted entirely to incentive travel. Contains lots of useful information . . .

United Aircraft Corp. says it spent more than $1,775,364 as a customer of commercial airlines in 1956. Passenger travel totaled $1,153,429; air freight and air express, $529,241; air mail and air parcel post, $92,694. Expenditures for cargo, freight and express covered more than 3,707,671 lbs. of material. Company representatives traveled more than 17 million passenger-miles and conducted business in virtually every country in the free world . . .

Continental Air Lines' flight service department, headed by vice president Lynn Dennis, has a new name—passenger service department—to more clearly indicate the scope of its activities. The department handles reservations, airport ticket counters, dispatching, baggage handling, passenger conveniences, hostesses and food service . . .

Printers Ink magazine lists last year's outdoor advertising expenditures as follows: American, $90,286; Capital, $30,823; Delta, $50,539; Frontier, $20,172; North Central, $22,646; TWA, $71,036; United, $136,176; Western, $60,926 . . .

Eastern Air Lines is distributing three folders promoting its 1957 Happy Holidays package vacation plan. A total of 1,750,000 has been printed. Advertising has already started in travel sections of Sunday papers in 15 northern cities. In 1956, EAL sold 75,000 packages, a 23% gain over 1955 . . .

A new product that may interest passenger service departments is "Ozium," described as a "glycol-ized air conditioner." Spray from new "personal size" dispenser is said to remove smoke, destroy odors, reduce airborne bacteria and "beneficially treats the air indoors wherever people congregate." Manufacturer is Woodlets Inc., 2048 Niagara St., Buffalo, N. Y. . . .

Sabena Belgian World Airlines is conducting sea-air cruises in conjunction with the Italian Line. Descriptions of the 66 tours are contained in a new booklet, "Sea-Air Cruises," available from Sabena or from travel agents . . . TWA has published a brochure covering its 1957 "Skyliner Tours of Europe" . . . And a new Air France folder describes "Tri-Color Tours to Europe" . . .

Machines and machine parts, for the fifth straight year, topped cargo commodities carried by **United Air Lines** in 1956. Ranked by weight, the nine other leading freight items were cut flowers, electrical equipment, wearing apparel, auto parts and accessories, printed matter, aircraft parts and accessories, live animals, hardware and advertising matter . . .

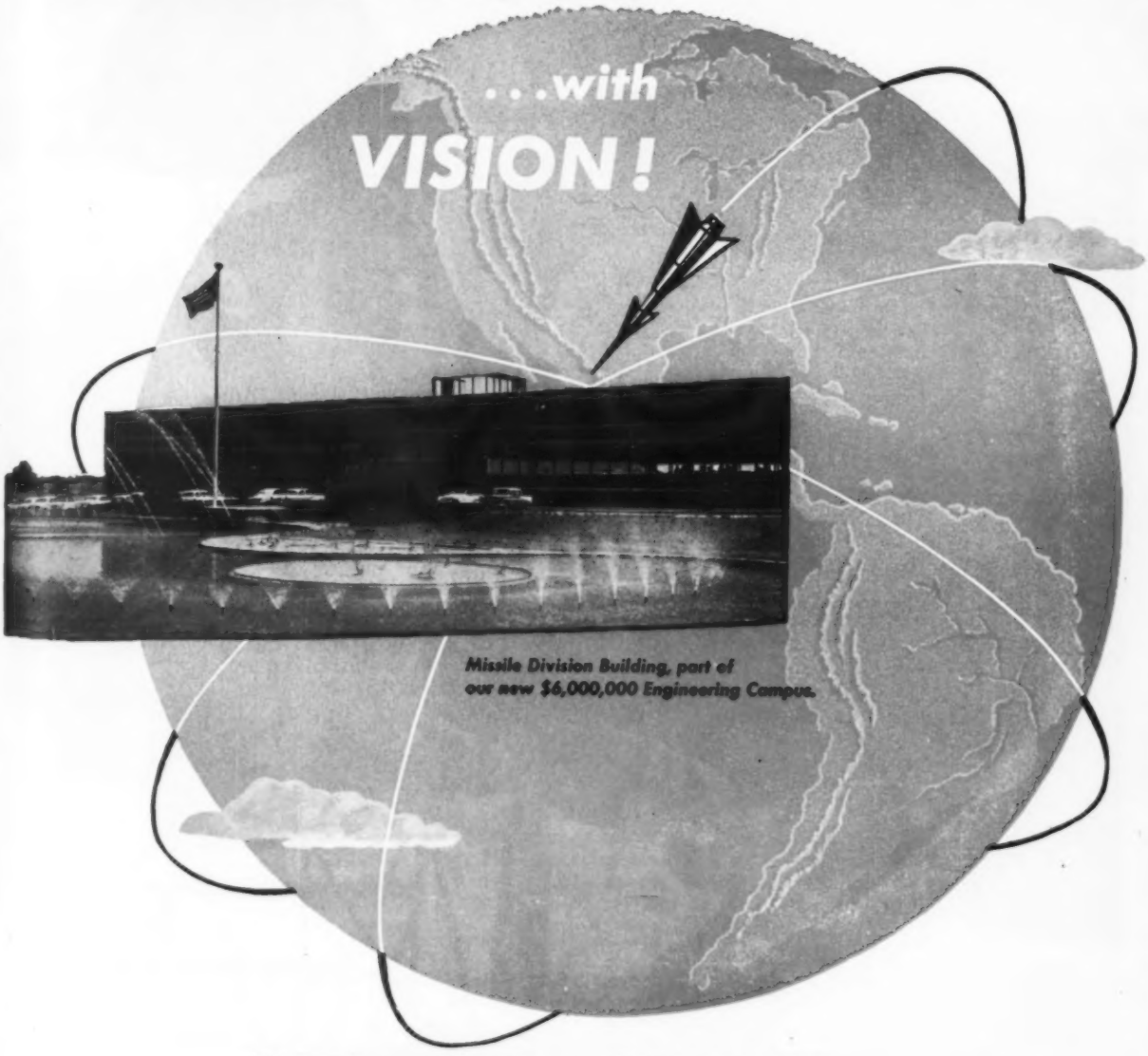
Pan American World Airways and Chicago Helicopter Airways on April 1 start a shuttle service similar to that of New York Airways and international carriers at New York airports. PAA passengers will be flown free between Chicago's Midways and O'Hare Fields when making connections with domestic flights . . .

Pan American, in announcing that it will link its 30 U.S. and Canadian sales offices to its automatic reservations system (Teleregister) in New York, gives interesting figures on operation of the New York set-up. PAA says it has been able to cut "lost calls" by 85% and waiting time for passengers telephoning for reservations by 50%. This was during a time when telephone volume increased by 8%. And last June, the system "answered" 310,000 queries for available space. On one day, June 22, the machine received 18,000 calls and answered each of them in less than four seconds . . .

Travel agents accounted for 17.1% of **Capital Airlines'** total passenger revenue last year, an increase of more than 45% over 1955 . . .

United Air Lines is now providing special menus for babies. There's a choice of four cereals, four "entrees," three fruits, dessert, crackers and milk. The attractive menus can be kept as souvenirs; there are spaces for recording baby's name, date and flight number, and name of the stewardess preparing and serving the meal . . .

ENGINEERS



Missile Division Building, part of our new $6,000,000 Engineering Campus.

M.A.C. engineers must have the necessary vision to project their thinking into the future in a constant quest for more speed, versatility, greater range and dependability... hallmarks of McDonnell designed products! Some examples of this daring engineering spirit are the F-101 Voodoo—F3H-2 Demon jet fighters, the XV-1 Convertiplane, and the Talos guided missile.

Do you have the initiative necessary to accept the challenge offered in airplane, helicopter, and guided missile development? Stimulating work and job security can be yours at M.A.C. We have never had an engineering layoff in our seventeen year history.

MACareers Are Successful Careers!

ST. LOUIS: *"A Good Place to Live and Raise a Family!"*

Secure our four-color pamphlet giving facts and cost figures on suburban life in this area. Write:

RAYMOND F. KALETTA
TECHNICAL PLACEMENT SUPERVISOR
P. O. Box 516, St. Louis 3, Missouri

McDONNELL *Aircraft Corporation*

What airline is giving all its planes radar "eyes"?

United Air Lines

First U. S. airline to order radar for all its planes, United now has the world's largest radar fleet—and more coming. Radar lets your pilot "see" through cloudy skies 150 miles ahead, helps him pick the best and smoothest course. You experience new comfort and even greater on-time dependability at any time of year when you fly United. For reservations, call or write United Air Lines or an Authorized Travel Agent.

UNITED
AIR LINES

TRANSPORT TRENDS

Recent CAB staff support for a New York-Puerto Rico route for Trans Caribbean Airways is considered tip-off that some new companies may enter the certificated passenger field. Domestically, California Eastern is mustering strong support in the Dallas to the West Case. Puerto Rico decision should come late this year. Dallas case is one to two years away.

Expedited mail program may be a long time coming. This is the opinion of some qualified airline observers. The program, under which all first-class mail would move by the fastest means at a 5¢ rate, has been shelved. Instead, Post Office has asked Congress to up first-class postage to 4¢, airmail to 7¢. This will mean higher rates with no improvement in service. Expedited plan would have been a revolutionary improvement. But PO evidently heeded warnings of some legislators that 2¢ postage jump would be defeated.

These developments could delay expedited program by a minimum of two years, observers think. They reason that if Congress okays 4¢ and 7¢ it will be very reluctant to grant another increase any time soon.

PO, incidentally, had started its planning for expedited mail. And it probably would have paid airlines about 30¢ a ton-mile for hauling 5¢ letters.

Mushrooming transatlantic charter business is getting close attention of CAB. A new policy and tighter enforcement may result. U.S. flag lines complain that present policy, adopted in May, 1955, is being abused with resulting traffic diversion to charter operators. CAB has closed one eye to alleged violations in the past. But the business has reached such proportions that a new policy will be considered.

Latest flare-up in the 30-year fight between Pan American World Airways and W. R. Grace over their co-ownership of Panagra (see page 76) raises the question of who will finally decide the controversy. There are two possibilities: (1) Justice Department might order the "solution," (2) CAB could start a new route case to try to settle the dispute. Justice Department currently has control of the situation by virtue of its anti-trust action, started in January, 1954, but not yet subject to jury trial. If Justice turns it over to CAB, the status quo will be maintained for several years while the new route case is tried.

Airlines are becoming increasingly time-conscious as they try to reach decisions on selecting, buying and scheduling spare parts and ground support equipment for jet transports. A purchasing official of one carrier pointed out recently that only 380 working days remain until introduction of jet service.

Douglas reveals details of two shorthaul aircraft, 4-engined turboprops, designed to replace DC-3

Long expected bid by Douglas Aircraft Co. for the lucrative "DC-3 replacement" market has moved into the brochure stage.

Under a special project, reportedly authorized by Donald Douglas, Sr. to spend about $500,000, the Santa Monica firm has received clearance from State Department's Office of Munitions Control to talk details on not only one, but two shorthaul transport models.

Both are high-wing, four-engine turboprops grossing 65,500 pounds. The Model 1940 (a Douglas engineering project number as distinguished from the usual DC commercial sales designation) is a 42-to-60-passenger transport aimed at the U.S. local service airline and foreign shorthaul markets.

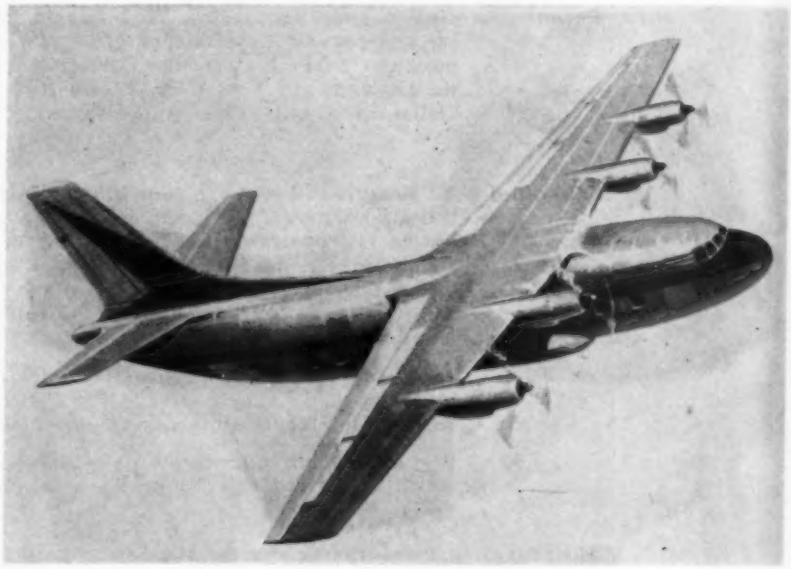
Douglas Model 1940A, almost identical in overall geometry, is proposed as a civil as well as military utility transport. It would be fitted with a universal landing gear/ski arrangement for takeoff from soft terrain and unimproved airfields.

Although Douglas disclosed no information on powerplants, reliable sources indicate the frontrunner is Lycoming's T55 free turbine, derated for this application to 1,500 equivalent shaft horsepower. T55 engine was declassified by the Pentagon this week at a rating of 1,651 eshp for takeoff and 1,383 continuous (see story this section).

Most significant factor in Douglas' unveiling of the new model—is that it represents its first tangible proposal of actual DC-3 replacement hardware since its unsuccessful bid with the Super DC-3 in the late 1940s.

And although Douglas officials caution that no final decision has been made to build the Model 1940, it is understood volume orders placed this year would result in development and production for 1960 delivery.

Of almost equal significance is Douglas' design approach. The company is making its first bid for the shorthaul market without "gimmicks" such as the earlier reported hinged wing, or such devices as boundary layer control or jet flaps.



Instead, Douglas has shaped its design proposal with emphasis in three areas it feels will win the feeder airline nod. They are (1) four-engines for reliability; (2) pressurization for passenger comfort under rapid climb and descent rates prevalent in "pogo stick" feeder operations; (3) retention of maximum landing weight as close as possible to gross takeoff (within 500 lbs.) to avoid excessive operational delays, fuel costs, etc.

Price tag remains indefinite

Big question mark still to be resolved by Douglas is the price tag for its new transport. Although officials declined to comment, speculation is that the four-engine model in volume production would run about $1.2 million, just about double that of its only major competitor the Fairchild F-27.

The Model 1940, however, at 65,500 lbs. almost doubles the F-27's current gross weight of 34,320 lbs.

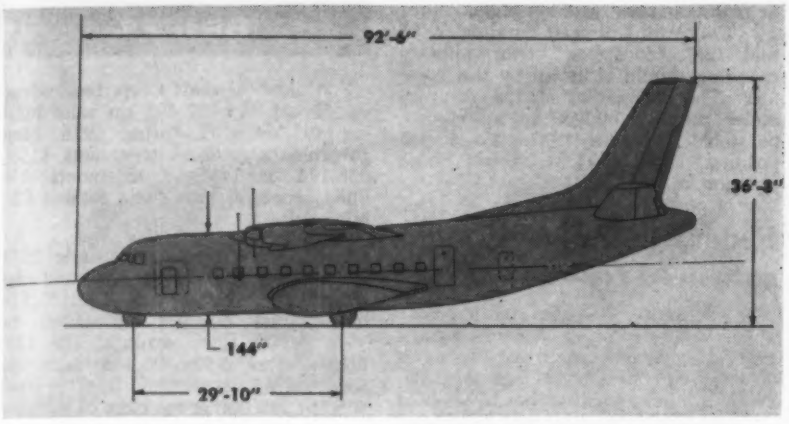
Douglas' aim is to win the shorthaul market with an airplane that is economical down to 80 nautical mile

Specifications for Douglas Models 1940, 1940A

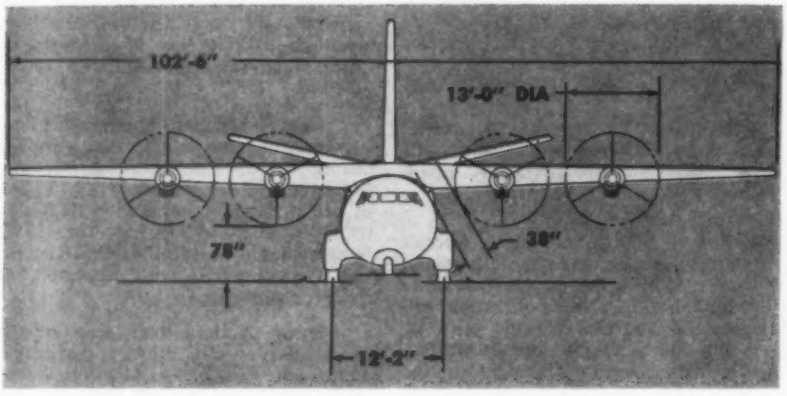
Dimensions	Model 1940	Model 1940A
Fuselage length	92′ 6″	85′ 10″
Wingspan	102′ 6″	102′ 6″
Height (tail)	36′ 8″	36′ 8″
Wing area	1,300 sq. ft.	1,300 sq. ft.
Weights		
Max. structural takeoff	65,500 lbs.	65,500 lbs.
Max. structural landing	65,000	59,100
Max. zero fuel weight	56,000	50,920
Operating empty weight	40,815	34,920
Payload	15,000	16,000
Fuel weight (4,000 gal.)	26,000	26,000
Performance (Model 1940 only)		
CAA T/O field length*	2,330 ft.	
2nd segment climb limiting weight	73,000 lbs.	
CAA landing field length (at 59,600 lbs.)	2,770 ft.	
Range—at 15,000 lb. payload 65,500 lb. gross.	560 n.mi.	
Reserve fuel	3,760 lbs.	
Performance (Model 1940A)**		
Takeoff distance	1,000 ft.	
Cruise speed	243 knots	
Block speed	233 knots	
Range	1,590 n. mi.	

* At 65,500 lbs., sea level, standard day.

** From hard surface fields, without skis



SIDE AND FRONT VIEWS illustrate fuselage mounting of gear, high-wing design.



stages. On such a flight, assuming a 15,000 lb. payload, Douglas says the 1940 will average 262 knots cruise; cruise to 10,000 ft. with an 800-ft. cabin altitude; and wind up with a direct operating cost of 2¢ per 200-lb. nautical mile.

For 150-nautical-mile sector operation, cruising at 15,000 ft. with a 4,500 cabin, average cruise speed would be 262 knots, overall block speed 190 knots, and direct operating cost 1.605¢.

Convair buys $20 million CJ-805 jets for 880s

Convair has placed an initial order with General Electric Co. for more than $20 million worth of CJ-805 jet engines to power its Convair 880 commercial four-jet transport.

The order will provide enough engines for 40 planes. First delivery of the engine, which is the commercial version of the J79, is scheduled for July. 1958. Convair said the powerplants will be equipped with thrust reverse devices, sound suppressors and self starters.

Convair has boosted maximum cruising speed of its 880 jet transport from 609 to 615 mph with refinements introduced after windtunnel tests. Maximum takeoff weight has been upped to 178,500 lbs. and takeoff distance has been reduced 5%.

ATA issues new specs for manufacturers

Air Transport Assn., after a quick-recovery from its first "false start" on anti-collision system development, has issued a revised statement of system specifications to more than 1,000 manufacturers, airlines and electronic equipment firms.

The ATA draft, although continuing its support for a "self-sufficient" type system, opens the door for airline acceptance of two other arrangements —the "cooperative" system and a "hybrid" arrangement that would be self-sufficient for proximity warning and cooperative for collision avoidance.

Although ATA has set no deadline for industry reply to its proposal, it tentatively plans to convene its airline committee again early next month to review proposals by manufacturers.

Boeing, NAA get chemical plane contracts

Boeing and North American have received $6,770,000 in contracts to continue design studies in the WS-110 supersonic intercontinental chemical bomber competition. Boeing gets $3,-250,000 while NAA receives $3,520,-000. Air Force's Air Materiel Command made the announcement of the contracts.

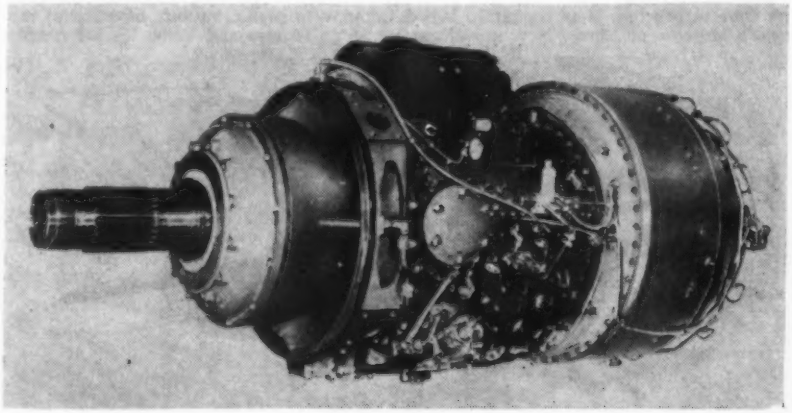
Pentagon okays Lycoming T55; Avco releases details

Pentagon this week gave Avco Lycoming Division first official approval to mention its T55 engine and simultaneously took the wraps off details on the new free turbine.

The T55, proposed as both an aircraft turboprop engine and helicopter powerplant, is classed by Lycoming as the most powerful free turbine developed in the U.S.

The turboprop version, reportedly slated for Douglas' Model 1940 short-haul transport, is rated at 1,651 eshp for takeoff and 1,383 continuous. Equivalent specific fuel consumption at these powers is .657 and .688 lb./eshp/hr. respectively. Weight is 665 lbs., diameter 24.25 in., length 58.5 in. and nominal output shaft speed 1,200 rpm.

For helicopters, T55 is rated at 1,676 eshp takeoff and 1,392 max. continuous; equivalent specific fuel consumption figures are .648 and .685 lb./eshp/hr. Weight is 600 lbs., diameter 24.25, length 44 in. and nominal output shaft speed about 6,000 rpm.



PAA asks right to serve some Panagra points

Pan American World Airways has applied to the Civil Aeronautics Board for certificate authority to serve South American points now on the routes of Pan American-Grace Airways. At the same time, PAA offered to sell its 50% interest in Panagra to Braniff Airways, if the new routes are granted.

The move was PAA's answer to an earlier petition by Panagra's other half-owner, W. R. Grace & Co. Grace, over the objections of PAA, asked CAB to extend Panagra's routes north to Miami, Washington and New York, and west from Balboa to San Francisco.

Meanwhile, Braniff said it would give "prompt consideration" to a Panagra purchase proposal if both PAA and Grace agreed to sell and if such a proposal is not conditioned on prior route awards in Latin America to PAA.

Investment firm reduces domestic trunk holdings

Asserting that "we obviously regard the domestic trunk lines somewhat less than optimistically," Frederick F. Robinson, president of National Aviation Corp., said his company has further reduced its holdings in airlines since the first of the year.

This continues a trend established last year when NAC, a closed-end investment company specializing in aviation stocks, reported that its holdings in aircraft and related items at year's end represented 60.3% of its total investments (up from 48.6% at the beginning of 1956) while airline holdings represented only 24.8% (down from 42.6% at the beginning of the year).

Airline shares have now been reduced to 20% of the firm's assets. Robinson said he saw no prospect of fare increases until possibly late this year or early next, and added that such an increase would have to be coupled with other improvements if the trunks were to maintain their profit margins.

Concerning aircraft companies, he said that "confusion" over military spending should clear up by this summer. The companies should do well under military budget appropriations, he stated, but added: "Our large cash position indicates that there's some question in my mind."

Federal data link system cuts need for voice

The data link system that has been under development six years as part of the Tacan navaid system for Navy has been shown publicly by Federal Telecommunication Laboratories division of International Telephone and Telephone Corp.

Known as the Tacan automatic reporting and data link, it is described by FTL president Henri G. Busignies as a step toward a "long-sought system to remove delay in air traffic control."

Basically the data link is a telemetry system designed to reduce the need for ground-to-air and air-to-ground voice communications to a minimum.

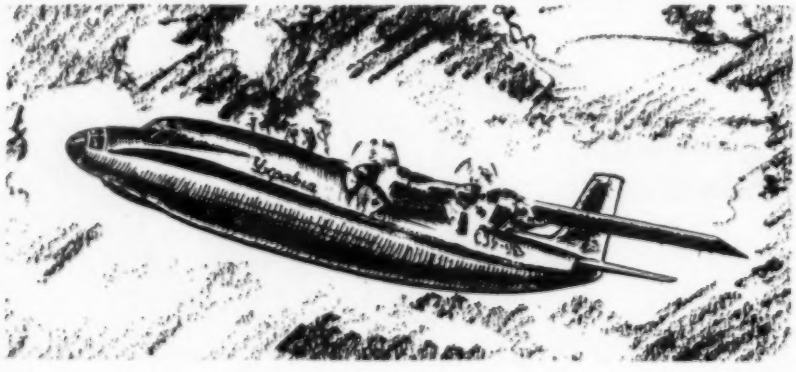
This is done by equipping aircraft and Tacan ground stations with encoding and decoding equipment that takes bearing, distance, North direction reference, airspeed and altitude information off the aircraft's instruments together with identity information, and codes them for transmission at high speed and regular intervals to ground equipment where the data is displayed either on duplicate instruments or a symbolic picture display.

Another feature is the ability to transmit a total of 31 "canned" messages from ground to air. These clearances, or commands are displayed to the pilot as words such as *land, hold, proceed,* etc.

In addition the pilot has a message selector panel on which may be selected 31 messages for reply such as *proceeding, roger, gas low, landing,* etc.

Latest Russian transport carries 84 passengers

RUSSIA'S LATEST TRANSPORT, the Antonov AN-10, has been rolled out. Powered by four turboprops, it is similar to AN-4 Camp twin-engine aircraft unveiled at last year's Moscow air show. New model carries 84 passengers and 7,000 lbs. of freight.



BRIEFS

United Aircraft Corp. realized net income of $37,082,493 on sales totaling $952,885,142 during 1956. Non-government business represents $135,056,175 or 14% of shipments. Unfilled orders at year's end totaled $2.3 billion.

Curtiss-Wright Corp. made $571,064,793 in sales during 1956 and realized a net income of $43,153,518. Commercial business accounted for 59% of the total earnings. The 1955 figures were $508,703,445 sales and $35,081,045 net income. Backlog stood at $754,280,000 at the close of the year.

Boeing Airplane Co. reports record earnings of $32,134,989 for 1956. Sales for the year totaled $1,006,356,748. Year-end backlog was $3,024,000,000. Commercial sales amounted to $638,000,000.

Chance Vought Aircraft, Inc., showed a decline in sales and earnings during 1956. The company reports $118,186,055 in sales and $4,135,181 in net earnings, compared with $147,095,440 and $4,759,544 for 1955. Backlog stood at $508,000,000 December 31, compared with $214,000,000 the year previous.

Ryan Aeronautical Co. reports gross sales of $46,998,925 during the 12 months ending Oct. 31. Net profit after taxes was $1,256,769. Backlog stands at $92 million. Previous year totals were $41,527,770, $1,550,590 and $75 million backlog.

Vertol Aircraft Corp. reports net earnings of $3,437,563 for 1956, a gain of 121% over 1955. Sales for 1956 were $90,025,697, 56% higher than year ago.

United Air Lines earnings and gains from sales of surplus aircraft totaled $14,680,535 during 1956 compared to the 1955 figure of $11,244,577. Earnings from operations were $10,341,137 down from $11,164,029 in 1955. Gains from plane sales were $4,339,398 compared to $80,548 in 1955.

Eastern Air Lines shows net income of $14,197,500 for 1956 (preliminary unaudited figures) compared to $9,342,791 in 1955. Gross operating revenues were $228,040,200 up 14.8% over the 1955 total of $198,608,302. Operating expenses increased $27,526,800 from $172,083,579 in 1955.

National Airlines reports net income before taxes for the first half of the current fiscal year of $1,368,843 which was $153,624 under the amount of the comparable period a year ago.

Western Air Lines earned $3,044,458 during 1956, up from the 1955 figure of $1,981,685. Earnings represent $3.91 a share compared to $2.67 a share in 1955.

"SNORKEL"

...lighter, smaller hot air shut-off valve provides efficient anti-icing air control

This Whittaker-designed Solenoid Pilot Actuated Hot Air Shut-off unit is extremely light and compact for the performance requirements it meets—actually lighter by a full pound than comparable units of conventional design and construction.

The pilot valve assembly is extremely simple, having only one moving part. Rated flow is 55 lb/min. The valve has extremely low port-to-port leakage of .05 lb/min. at 45 psig.

PERFORMANCE

TEMPERATURE.
Ambient, —65°F to +250°F
Line, —65°F to +550°F

ELECTRICAL POWER REQUIRED. 1.0 amps at 30 VDC (Rated 18-30 VDC)

LIFE. 100,000 cycles without adjustment, lubrication, or any attention of any type.

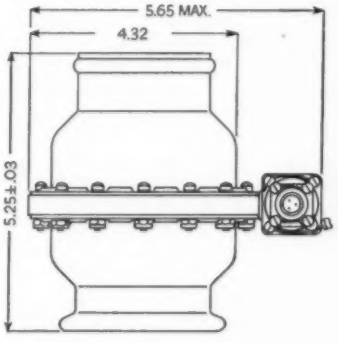
SERVICE FLUID. Hot Air.

PRESSURE. From 10 psig (minimum operating pressure) to 75 psig (maximum operating pressure).

WEIGHT. 1.8 lbs.

LINE SIZE. 2.5 dia.

FLANGES.
Inlet, (per customer spec)
Outlet, (per AND10060)



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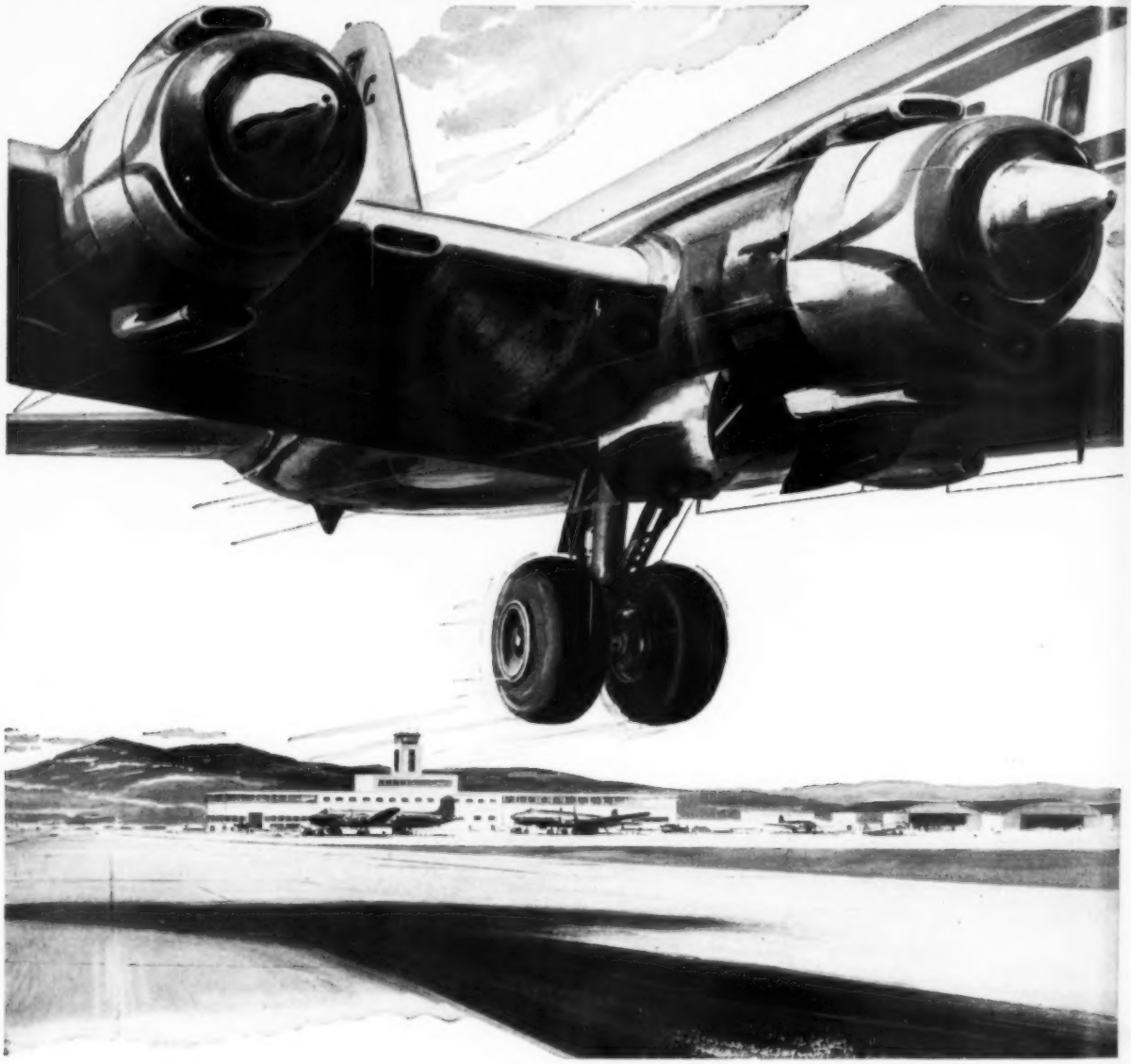

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1

Tops with AIRFRAME MANUFACTURERS

With over *$6½ billion* business last year . . . and growing . . . American Aviation covers *100%* of this market.

2

Shines among ENGINE MANUFACTURERS

Almost *$2 billion* business last year. American Aviation penetrates *100%* of this market.

3

Clicks with COMPONENT MANUFACTURERS

More than *$2½ billion* last year; with *96%* of this market blanketed by American Aviation.

4

Pinpoints the MILITARY

Buying is channeled through 18 procurement offices. American Aviation is read in *100%* of these offices.

5

Sky-high with U. S. AIR CARRIERS

Accounting for over *$1½ billion* last year; with American Aviation accounting for 100% of this market.

6

Biggest seller in BUSINESS FLYING

American Aviation hits home with *77%* of major corporations operating their own planes.

7

Out front at the TERMINAL AIRPORTS

This important market spent almost *$250 million* last year. American Aviation wraps up *100%* of U.S. terminal airports.

8

Air Frame Manufacturers	100%
Engine Manufacturers	100%
Component Manufacturers	96%
Terminal Airports	100%
Air Lines	100%
Industrial Plane Owners	77%
Department of Defense	100%
Average for all seven categories:	91.07%
Total Circulation:	46,721

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*Advertising Deadline: APRIL 1, 1957

Aviation Publications, Inc.

Advertising Offices: 17 East 48th Street, New York 17, N. Y., PLaza 3-1100

Editorial Offices: 1001 Vermont Ave., N. W., Washington 5, D. C. Sterling 3-5400

PEOPLE

C. A. Myhre, president of Frontier Airlines, received the 10th annual Aviation Award from the University of Denver in recognition of his contributions to the progress of aviation. Award was presented by Chancellor Chester B. Alter (right) of the university. It is part of the program of Alpha Eta Rho fraternity, which is made up of students attending the university's School of Aeronautics. ➡

Prince Bernhard of the Netherlands got a close look at Northrop Aircraft's new supersonic trainer recently on a visit to the West Coast manufacturer. Here he examines the cockpit while Whitley C. Collins, Northrop president, explains the design concepts. The prince is a veteran pilot, holds the rank of lieutenant colonel in the Dutch Air Force. He makes periodic visits to the U.S. to inspect American aircraft development and production techniques.

⬅

Dr. Louis N. Ridenour, To Direct Lockheed missile R&D program

Missile Systems division engineering and research branches are being integrated under the former director of research. Willis M. Hawkins director of engineering, becomes assistant general manager.

Convair-Astronautics becomes operating division under J. R. Dempsey

New division is builder of Atlas ICBM, will move into its own $40-million plant near San Diego later this year. It is Convair's fifth operating division. Dempsey has directed Atlas program since 1954.

William T. Piper and his three sons were on hand for the first stock transaction following admission of Piper Aircraft Corp. to the New York Stock Exchange. From left: Ralph C. Smith, specialist in Piper stock; Thomas F. Piper, vp-operations; William T. Piper, Jr., executive vp; Howard Piper, vp for Research and Development; William T. Piper, president and chairman of the board, and G. Keith Funston, president of the New York Stock Exchange.

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MANUFACTURING

Name	New Position	Former Position
J. Labarre Comer	Mgr.-marketing research, General Electric's Light Military Electronic Equipment Dept.	Supv.-marketing research
Harrison A. Storms, Jr.	Chief engr., Los Angeles Div., North American Aviation	Mgr. research & development
Earle W. Barry	VP-sales, Royal Gull amphibians	Sales exec., Aviquipo, Inc.
Don Fairchilds	Dir. pub. rel., Non-Linear Systems, Inc.	Pub. rel. mgr., LearCal Div., Lear Inc.
Harold Hechtman	Dir. pub. rel., Airborne Instruments Laboratory, Inc.	Admin. asst. to pres.
John A. Robertshaw, Jr.	VP, Robertshaw-Fulton Controls Co.	Asst. vp, foreign operations
Ronald Smelt	Dir. of new design, Lockheed Missile Systems Div.	Chief of Gas Dynamics Facility, ARO, Inc.
Glenn A. Walters	VP, Dalmo Victor Co. and dir. of research	Dir. of research
D. E. Pederson	Mgr. mfg. engrg., Axelson Aviation, Axelson Mfg. Co.	Chief tool mgr., Rheem Mfg. Co.
RAdm. Delmer S. Fahrney, (USN, ret.)	Sec'y, Committee on Sci. and Arts, The Franklin Institute	Writing history of "Radio Controlled Aircraft and Guided Missiles" for BuAer
L. A. Skinner	Mgr. missile oper., Radio Corp. of America, White Sands Proving Grounds	Various industrial exec. capacities
Albert Diamond	Chief engr., rotating equip. dept., Helipot Div., Beckman Instruments, Inc.	With Kollsman Instruments Co.
James F. Gordon	In chg. design work and advanced engrg., Helipot Div., Beckman Instruments, Inc.	Chief development engr.
George M. Matteson	Chief, production flight, Los Angeles Div., North American Aviation	Asst. chief
James R. Lewis	Dir. pub. rel., The Ramo-Wooldridge Corp.	Sr. staff asst., Guided Missile Research Div.
C. A. Degucz	Mgr. aviation battery sales, The Electric Auto-Lite Co., Toledo	Dir. aircraft sales, Reading Battery Div.
Robert J. Geis	Mgr.-marketing, commercial sales dept., Beech Aircraft Corp.	Regional sales mgr.
Charles M. Kearns, Jr.	Asst. gen. mgr., Hamilton Standard, div. United Aircraft Corp.	Engineering mgr.
William E. Diefenderfer	Engrg. mgr., Hamilton Standard div. United Aircraft Corp.	Asst. chief engnr.
James D. Redding	Gen. mgr., sales & service dept., Westinghouse Aviation Gas Turbine Div.	Mgr., headquarters sales dept.
Sam C. Breder	Retired	Dir. Customer Service Div., Ryan Aeronautical Co.
Orrin C. Bowers	Chief engr., BJ Electronics, Borg-Warner Corp.	Projects mgr., Electronic Instrumentation Div.
William E. Crowell	Head, Weapon Systems Design Dept., Cornell Aeronautical Laboratory	Asst. head
Donald E. Brown	Chief engr., Glendale Div., Consolidated Electrodynamics Corp.	Engrg. specialist
Maj. Gen. Robert W. Douglass, Jr. (USAF, ret.)	New York representative, United Aircraft Export Corp.	USAF dealing with Latin American defense
John W. Robinson	Pub. rel. asst., Fairchild Engine & Airplane Corp.	Mgr. adv. and pub. rel., Fairchild Guided Missiles Div.
Frank M. Viles, Jr.	VP-mfg. of semi-conductors, Federal Telephone and Radio Co.	Tech. dir., Components Div., and Aircraft Program Dir.
G. A. Walley	Chief engr.-Alhambra, Calif. mfg. facilities, Panellit, Inc.	Sr. project engr.
Edward S. Maury	VP-Instrument Div., Marion Electrical Instrument Co.	Gen. sales mgr.
Harry A. Donahue, Jr.	VP-Aviation Div., Marion Electrical Instrument Co.	Aviation sales mgr.
Gomer L. Davies	Gen. mgr., Davies Laboratories, Inc., a new div. of Minneapolis-Honeywell	President, Davies Lab.
William W. Price	Dir. pub. rel., Bendix Radio Div., Bendix Aviation Corp.	Advertising mgr.
John W. Thompson	Gen. sales mgr., Caldwell-Wright Div., Curtiss-Wright Corp.	Sales mgr.
O. F. (Swede) Carlson	Spec. advisor, asst. to the pres., Douglas Aircraft	Brig. gen., USAF
R. E. Root	Dir. marketing, Aircraft Div., Rheem Mfg. Co.	Mgr., research and devel. laboratory
C. W. Halloway	Mgr. sales, Aircraft Div., Rheem Mfg. Co.	Contract administrator, Govt. Products Div.
Karl Weber	President, Weber Aircraft Co.	Pres., Weber Showcase & Fixture Co.
E. K. Meredith	Chmn. bd., Weber Aircraft Co.	President
Harold M. Cherry	President, George L. Nankervis Co.	Sr. vice pres.
Frank R. Perier	Pres. and treas., Tucson Instrument Corp.	VP and gen. mgr., Technology Instrument Corp. of Acton, Mass.
Dalton H. Miller	Gen. mgr., special bearing plant, Western Div., Industrial Tectonics, Inc.	Consulting engr., Albert Ramond and Associates
John C. Waugh	Mgr. pub. rel., Vertol Aircraft Corp.	Account exec., Hill and Knowlton, Inc.
Edward J. Gorman	Asst. to vp and sec'y, Vertol Aircraft Corp.	Spec. asst. to asst. chief, BuAer
Andrew S. Gantner	Adv. mgr., Hertz Rent A Car System	Dir. adv. and sales promotion, Peter Hand Brewery Co., Chicago

AIRLINE

Clinton Davidson, Sr.	Chmn. bd. and chief exec., Resort Airlines	Business and investment counseling
R. I. Hager	VP, Agey Advertising, Inc.	VP, asst. to the pres., and dir., Piedmont Airlines
John W. Birch	Dir. station operations, Slick Airways	Asst. to vp-properties, Eastern Air Lines
Gen. Aubry Lee Moore	Dir. international operations, Slick Airways	Mgr. Hillsboro (Tex.) Chamber of Commerce
Capt. Floyd D. Hall	Dir. flight operations, Trans World Airlines	Mgr. flying-staff, Kans. City, Mo.
Norman Blake	Mgr. Atlantic Div., Pan American World Airways	Exec. asst. to exec. vp
John H. Taylor	Supt. of flight control, Mohawk Airlines	Dispatcher
M. I. Perry	Mgr. reservations, United Air Lines	Mgr. telephone and ticket sales
G. M. Morris	Supt. reservations operations, United Air Lines	Asst. mgr. telephone and ticket sales
Stephen F. Buck	Dir. ground operations, Riddle Airlines	Admin. asst. to operations mgr.
P. W. Haddy	Chmn. Australian National Airways	Also gen. mgr., Adelaide Steamship Co.

GOVERNMENT

Harry H. Schneider	Chief, rates div., Bur. of Air Operations, CAB	Asst. chief
Roy Keeley	Dir., Office of Flight Operations and Airworthiness, CAA	Deputy chief, Washington air carrier safety div.
Alexander D. Thomson	Consultant, Administrator of the Defense Air Transportation Admin.	Also pres., T. O. Ranch Co., and the Rocky Mountain Corp.

BOOKS

Aerodynamic Components or Aircraft at High Speeds. *Edited by A. F. Donovan and H. R. Lawrence as volume VII of the series "High Speed Aerodynamics and Jet Propulsion." Published by Princeton University Press, Princeton, N. J. 845 pp. Price, $17.15.*

The contributors to this text give an exhausting treatment of the highspeed characteristics of wings, bodies, propellers, diffusers and nozzles. Interference effects and nonsteady flows are also examined.

In particular, the text discusses steady-state wing theory, and gives extensive tables of two-dimensional and conical flow functions for various aerodynamic shapes; the aerodynamics of bodies at high speed, with attention given to bodies of revolution and to bodies of noncircular cross-section, and interaction problems.

With enough stamina, an engineer will in most cases be able to find what he is looking for.—W. B.

Fly for Your Life, by Larry Forrester. *(Frederick Muller Ltd., 110 Fleet St., London, E. C. 4. 18 shillings, $2.52 plus 20¢ postage.)*

The story of Wing Commander Stanford Tuck, a top-scoring RAF WW II fighter pilot with 29 confined victories. Tuck, a pre-War regular officer, fought in France, in the Battle of Britain and was shot down in 1943, to remain a prisoner until he escaped into Russia.

Breezily written, the book deals not only with RAF operations, but also with Tuck's experiences in the U.S. as a member of the 1941 RAF Liaison Mission, with life as a prisoner of war and also sidelights conditions in Russia at the end of the war.

Analog Computer Techniques. *By Capt. Clarence L. Johnson. Published by McGraw-Hill Book Co., Inc. 330 W. 42 St., New York 36, N. Y. 264 pp., Price, $6.*

This treatment of electronic analog computers (or electronic differential analyzers) was written as an aid to the computer operator. Material is presented in a way that an engineer with a knowledge of Ohm's law, Kirchoff's laws and elementary differential equations can understand most of the demonstrations.

Book treats in detail the use of diodes and differential relays in analog computations. Special emphasis is given to function generating techniques including methods of representing functions of more than one variable.

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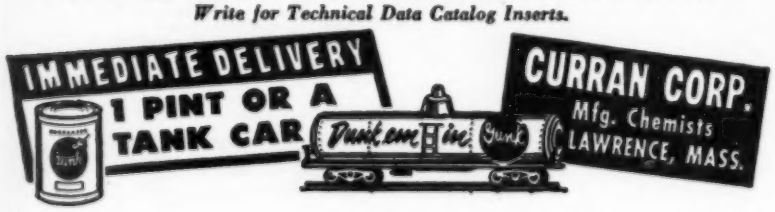

CONTRACTS

Commerce Department has announced the following contracts:

North American Aviation, Inc., $4,024,717, converting 355 F-86D aircraft to F-86L configuration.

Lear, Inc., Grand Rapids, Mich., $2,556,750, altitude indicators and roll-pitch control for F-101B, F-102A and F-102B aircraft.

Bendix Aviation Corp., Products Division, South Bend, Ind., $1,016,469, main brake assemblies.

Air Materiel Command has announced the following contracts:

Olin Mathieson Chemical Corp., Aviation Division, Niagara Falls, $33,500,000, high energy fuel production facilities.

General Electric Co., Schenectady, $2,338,000, fighter-bomber fire control systems.

Summers Gyroscope Co., Santa Monica, $1,934,152, directional gyroscope indicators, spares and tools.

RCA Service Co., Camden, N. J., $1,284,352, on-site aircraft control and warning weapons maintenance for Central Air Defense Forces.

Avco Manufacturing Corp., Williamsport, Pa., $1,236,175, engines and related data, maintenance tools and test equipment.

General Precision Laboratories, Pleasantville, N. Y., $4,232,404, two contracts for amplifier electronic control and radar net.

Temco Aircraft Corp., Greenville, Tex., $1,056,963, modification for B-50.

Bell Aircraft Corp., Ft. Worth, Tex., $3,372,771, H-13H helicopters.

Sundstrand Machine Tool Co., Rockford, Ill., $3,213,703, speed drives for F-106.

Westinghouse Electric Corp., Lima, O., $1,600,046, generator regulators and other equipment.

Lear Inc., Grand Rapids, Mich., $2,556,750, aircraft controls and indicators.

Bendix Aviation Corp., Radio Div., Baltimore, $9,927,631, AN/GPA radar set groups.

International Business Machines Corp., New York, $2,201,677, logistic support for directional information center.

Goodyear Aircraft Corp., Akron, O., $1,279,496, Matador guidance system facilities.

North American Aviation, Downey, Calif., $1,082,670, plant maintenance; Los Angeles, $1,669,600, technical services.

Air Logistics Corp., Pasadena, Calif., $2,450,000, trailers.

Lockheed Aircraft Corp., Marietta, Ga., $2,046,000, plant maintenance.

Following contracts were announced through the Commerce Dept.:

Boeing Airplane Co., $10,901,455 and $6,879,500, B-52 production facilities at Wichita.

Eclipse Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., $6,736,102, central air data computers for F-101 and F-105 $1,740,427, indicators; Red Bank Div., Eatontown, N.J., $3,275,220, F-104 generators, and $315,908, F-105B generators.

Crosley Div., Avco Mfg. Corp., Cincinnati, $2,500,000, MD-9 fire control system.

Aviation Products Div., B. F. Goodrich, Akron, $2,806,333, pressure suit components.

Hayes Aircraft Corp., Birmingham, $2,979,366, KB-50 modification parts and accessories.

the bulletin board

Undisplayed Advertising: $1.50 per line, minimum charge $6.00. Cash with order. Estimate 30 capital letters and spaces per line; 40 small lower-case letters and spaces per line. Add two lines if Box Number is included in lieu of advertiser's name and address.

Displayed Advertising: $18.00 per column inch. Space units up to full pages accepted in this section for classified-type advertising.

Forms close three weeks preceding date of issue. Address all correspondence to Classified Advertising Department, American Aviation Publications, 1001 Vermont Ave., N. W., Washington 5, D. C.

Help Wanted

Experienced Operations Manager desires position with Airline or Corporation. Box 101, American Aviation Magazine, 1001 Vermont Avenue, N. W., Washington 5, D. C.

SALES MANAGER: Civil-Mechanical Engineering background. Graduate Engineer, graduate work in Business Admin. 12 years sales and sales management experience. Honor student. Resourceful, ambitious, tenacious. Box 104, AMERICAN AVIATION Magazine, 1001 Vermont Avenue, N. W., Washington 5, D. C.

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(Formerly Lear Aircraft Engineering Division)
Santa Monica Airport, Santa Monica, California
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HONORS

Col. Albert A. Arnhym, director of information services, Air Research and Development Command, received Legion of Merit for developing Staff Film Reports, described by ARDC as "a most efficient means of informing all military and civilian elements of this country of the USAF's research, development and test program."

Robert J. Smith, president of Slick Airways, was nominated by President Eisenhower for appointment as Major General in United States Air Force Reserves.

Douglass F. Johnson, president of Aircraft Engineering & Maintenance Co., Oakland, Calif., was elected chairman of board of governors of The Aircraft Service Assn.

John Jay Hopkins, chairman and president of General Dynamics Corp., was named a Chevalier of the Legion of Honor by the Government of France for his role in international aviation and his efforts "to bring the blessings of nuclear energy to the underprivileged peoples of the world."

Jack T. Jefford, chief of CAA's Airways Flight Inspection service in Alaska, received a Department of Commerce gold medal "for his significant contributions to the development of Alaskan aviation and his resourceful and willing performance of flight transportation services for Alaskan facilities and personnel."

Dr. John Eldred Smith, deputy chief, CAA Medical Division, received a citation and Department of Commerce gold medal "for outstanding contributions to medical science and to aviation medicine in the field of cardiology."

Claire L. Egtvedt, Boeing Airplane Co. board chairman and "father of the four-engined bomber," was named University of Washington's most distinguished alumnus for 1957.

Lewis J. Jeffers, president of Hayes Aircraft Corp., Birmingham, Ala., has received the "Gold Knight of Management" award of National Management Assn., and was named Alabama's "Management Man of the Year" by that state's NMA council.

honor roll—

(For 25 years' or more service in the industry)

Claude Hill, Boeing Airplane Co. General foreman, Seattle Div., wood and template shop (40 yrs.)

William Littlewood, American Airlines. VP-equipment research, Washington, D.C. (30 yrs.)

Manfred G. Boe, Northwest Airlines. Mechanical supv., St. Paul, Minn.

Croil Hunter, Northwest Airlines. Chmn. of board, St. Paul, Minn.

Joseph Schuster, Northwest Airlines. Mechanical supv., St. Paul, Minn.

Anthony Vendetti, Pratt & Whitney Aircraft. Packaging technician, E. Hartford, Conn.

Otto Herrmann, Pratt & Whitney Aircraft. Inspector, quality review dept., E. Hartford, Conn.

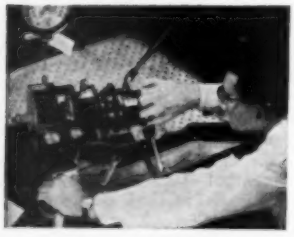
Einar Freberg, Pratt & Whitney Aircraft. In process planning, production engrg., E. Hartford, Conn.

William Abbott, Pratt & Whitney Aircraft. Lathe operator, E. Hartford, Conn.

TEST EQUIPMENT

The Test Equipment Engineer is engaged primarily in the design of specialized missile check-out equipment. As missiles push the state of the art, test equipment must exceed the missiles in precision and reliability. Automatic programing, go-no-go evaluation, and automatic data processing add up to automation in missile testing.

This engineer is evaluating his design of a precision power supply—one of the building blocks that will be system engineered into a family of versatile matched missile and sub-system test equipment. Engineers work as individuals.



HYDRAULIC DESIGN

Excellent opportunities are available for the engineer to observe the performance of his design. Here, under the watchful eyes of its designer, a hydraulic power unit is undergoing adjustment and setting prior to severe testing at simulated high altitude conditions.

Many components, which a few months ago seemed almost impossible to design, are now being tested under the severe conditions required to qualify them for flight operation—and passing with flying colors.

STEERING INTELLIGENCE

Two Steering Intelligence Engineers discuss space allotment in a new guidance component. This close association of engineers with the "flying" equipment is typical of the Steering Intelligence Section. Engineers in this section are primarily and directly concerned with refining the guidance equipment to steer the missile with greater accuracy, at greater ranges and with simpler and more reliable electronic equipment and, consistently, with minimizing the cost. Work is actively in progress in every principal field from microwave equipment to inertial and instruments.

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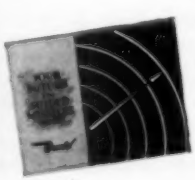
If you can accept a challenge, want an opportunity to grow with a leader in its field, and can accept the responsibility that goes with opportunity, send for the thirty-six-page book "Your Future in Guided Missiles". It gives the complete, detailed story of the function of the various engineering groups and the many job opportunities available for you.

Just fill out the coupon. It may help you plan a successful future in the guided missile field.



Bendix Products Division—Missiles
408 L, Bendix Drive, South Bend, Indiana

Gentlemen: I would like more information concerning opportunities in guided missiles. Please send me the booklet "Your Future In Guided Missiles".

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FACILITIES

Sperry Rand Corp. is planning a 150,000-sq.-ft. plant near Bristol, Tenn. The facility will produce additional requirements for naval ordnance systems, air navigation equipment and missile system equipment. About 1,200 will be employed.

Republic Aviation Corp. is moving its operations from leased plants at Greenlawn and Post Washington, L. I., to the main facility at Farmingdale. Move will be completed by July.

Huck Manufacturing Co. has established a west coast branch at Los Angeles. Warehousing and servicing operations will be located there. Company makes blind rivet and lock-bolt type fasteners and related tools.

Bomac Laboratories, Inc., Beverly, Mass. is building a $1-million plant which will double its facilities. New building, to be finished in May, will house manufacturing and assembly, engineering offices and a cafeteria. Plant will be used for magnetron production.

On Mark Engineering Co. moved its operations to San Fernando Valley Airport at Van Nuys, Calif. The company was located at Grand Central Airport, Glendale, before it erected 35,000 sq. ft. of hangar, warehouse, shop and office space at the new location.

Servomechanisms, Inc., will build a plant at Westbury, L. I. New structure will have 55,000 sq. ft. for engineering and administrative operations.

Pratt & Whitney Aircraft has awarded two contracts for construction of test facilities on the company's tract northwest of West Palm Beach, Fla. Project has no connection with construction of the main P&W Florida plant that will get under way this spring.

Ball Brothers Co. has formed a new research subsidiary in Boulder, Colo., to conduct fundamental and applied research in electronics, astrophysics, optics, servo mechanisms and other instrumentation.

Raytheon Manufacturing Co. is beginning construction on a 42,000-sq.-ft. electronics laboratory at Santa Barbara, Calif. Completion is slated for mid-June.

Finn Aeronautical Division, Hawthorne, N. J., has doubled its facilities by acquiring a 10,000-sq.-ft. plant adjacent to its present one. The company began operations last spring.

Texas Instruments, Inc., began construction of a 28,000-sq.-ft. plant for the Semiconductor Components Division at Dallas. The $4-million facility will employ 1,500 persons. Building is two stories high with a 7-ft. between-floor area for utilities and mechanical services.

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EN ROUTE

by Wayne W. Parrish

Report on Airports: Only 69 to Go

A lot of readers have been asking me how I'm coming along with my hobby of taking off from or landing at every airport in the U.S.A. served by scheduled carrier.

So while I'm off on another long air safari, this time on the Scandinavian Airlines System inaugural over the North Pole from Copenhagen to Tokyo and on down through Formosa to Australia and New Zealand, I present my annual report.

Currently there are 549 airports being served by one or more scheduled carriers. Out of this total I have 69 left to hit.

Seems like a lot, but I reduced the total by 36 during 1956, including one of the oldest in the U.S.—Elko, Nev., on United. Just when I'll reach the goal of 100% I wouldn't know, but would like to finish up in the next two years before jet transports come into service. For awhile the CAB was adding more airports than I was hitting, but I'm well ahead of the game now.

In 1956 on Eastern I knocked off Melbourne, Fla., Waycross and Macon, Ga., and later I hit Lake Charles and Lafayette, La. But I still have five EAL stops to make (Dothan and Muscle Shoals, Ala.; Rome, Ga.; Bowling Green, Ky., and Saranac Lake, N. Y.).

On Allegheny I finally hit Lock Haven and Clearfield, Pa., on a four-hour round-about from New York to Washington. This leaves me only Lancaster, Pa., but Allegheny is adding New Castle, Pa.; that will make two to go.

Sweating one out

On Continental I sweated through a long, tough 10-stop trip in a DC-3 on a blistering hot day between Dallas and El Paso in order to hit Snyder and Breckenridge, Tex. (And thanks to P. D. McCanlies, station mgr., for that cartoon sketch of my visit to Breckenridge.) Later I went on a round-about routing between Oklahoma City and Denver to hit Plainview, Tex., and still later I finally knocked off Great Bend, Kansas. So I have only one to go on Continental—Alamogordo, N. M.

At long last I cleaned up the coastal route of Southwest Airways north of San Francisco by hitting Ukiah, Calif. and on the same long day of DC-3 flying I hit Roseburg, Ore. and Chehalis, Wash., on West Coast. This leaves only Red Bluff, Calif. on Southwest, and McCall, Ida., a seasonal stop, on WCA.

One of the longest days of flying was a Northwest Airlines local (from early morning to midnight) from Seattle to Twin Cities, but I finished this route by hitting Kalispell and Bozeman, Mont.; Jamestown and Fargo, N. D., all new for me.

Two trips on North Central chalked up six new stops: Eau Claire, Wisc.; Winona, Minn.; LaCrosse, Wisc.; Bemidji, Minn.; Grand Forks, N. D., and Brainerd, Minn. But I've still got seven to go on NCA.

Although I still have four to go on Frontier, I managed to hit three new ones on this system last year—Glendive, Sidney, Mont., and Williston, N. D. Yet to hit are Flagstaff, Ariz.; Vernal, Utah; Wolf Point, Montana, and Dickinson, N. D.

It cost extra fare and a long day of flying between Los Angeles and Dallas, but I got off American at El Paso and took the Trans-Texas local so I could stop at Pecos, Tex. Four to go on TTA.

I did well on two trips on Northeast. I took a swing up through Bangor, Me. on the last day of the summer season and hit Lewiston, Rockland, Bar Harbor and Waterville, Me. Later I went to Boston via Lawrence, Mass. and Manchester, N. H. But I still have five NEA stops to go.

Here are some other facts:

There is still one carrier I've never been on. That's Lake Central. Many times I've tried without success to work it into a schedule. Once I got as close as checking in until I found out Lima, Ohio was cancelled because of high winds, so I cancelled too. But I hope to make all eight new stops on this system in 1957.

There are four carriers on which I've made every stop: American, TWA, Northwest and Mohawk.

I have only one stop to make on seven carriers: Capital (Morgantown, W. Va.), Bonanza (Santa Ana, Calif.), Southwest (Red Bluff, Calif.) Mackey (Fort Lauderdale, Fla.), Allegheny (Lancaster, Pa.), and West Coast (McCall, Ida.).

I have two to make on Delta (Selma, Ala., and Greenwood, Miss.) and two on Central (Stillwater, Okla., and Liberal, Kan.). And three to go on Braniff (St. Joseph, Mo.; Mitchell, S. D., and Minot, N. D.) and Southern (Laurel and Gulfport, Miss., and Dothan, Ala.).

Those with four are United, Ozark, Frontier and Trans-Texas. Those with five are Eastern, Northeast, and National. There are seven to go on Piedmont and North Central, and eight on Lake Central. The airline with the mostest to go is Western. Believe it or not, but I have nine on this carrier to hit, despite the fact that I've flown on its locals a number of times.

Out of the 69 stops to go, 25 are served by trunks and 47 by locals. (Several are served by both.)

Geographically, there seems to be no particular pattern. I have completed every airline stop in nine states, as follows: Maine, Connecticut, New Jersey, Delaware, Maryland, Tennessee, Louisiana, Colorado and Oregon.

This would seem to indicate I've done better in the East, but that isn't quite so. I keep a red pin in each airport not yet hit on the large Texaco map which is produced each year by *Official Airline Guide*, and the distribution of pins is pretty even.

Biggest concentration is North Carolina and Indiana with five each and South Dakota with four. There are three to go in Alabama, Arkansas, Florida, Michigan, Minnesota, Mississippi, Ohio and Utah. The other 28 states have either one or two to go.

Costly hobby

I find the hobby is costing a lot of dough and time due to the fact that local carrier hauls wreck advantages of round-trips on major tours. Not only is a lot of time lost, although I really never tire of flying, but it is discouraging to fly half a day and have the sought-after-airport flown over because of weather or no traffic or some other reason. I find that I have to fly a local route from two to four times to hit all the stops. The day of the "through local" seems to be over. And there are often difficulties in getting reservations cleared.

But I meet a lot of good people, run into some good food (like those chicken dumplings at the Bismarck N. D. airport), and see an awful lot of country. Usually I find DC-3 flying relaxing. Ordinarily I try to hit new stops merely by altering or adjusting or extending a routing to somewhere I'm going on business. Week-ends are usually good for my hobby but on the other hand I find local carriers apt to pass up stops when there's no business, so the time is lost.

Many airline people have gone out of their way to make my trips pleasant, such as Ed LeShane, station manager for West Coast at Medford, Ore. who took me to his country club for lunch along with W. L. Hicks, Jr., station manager for Southwest.

Among the penalties of my hobby is getting up sometimes before dawn to make an early local, grabbing sandwiches for lunch at a 3-minute stop, arriving late at night and losing a lot of sleep. But I like it all, anyway.

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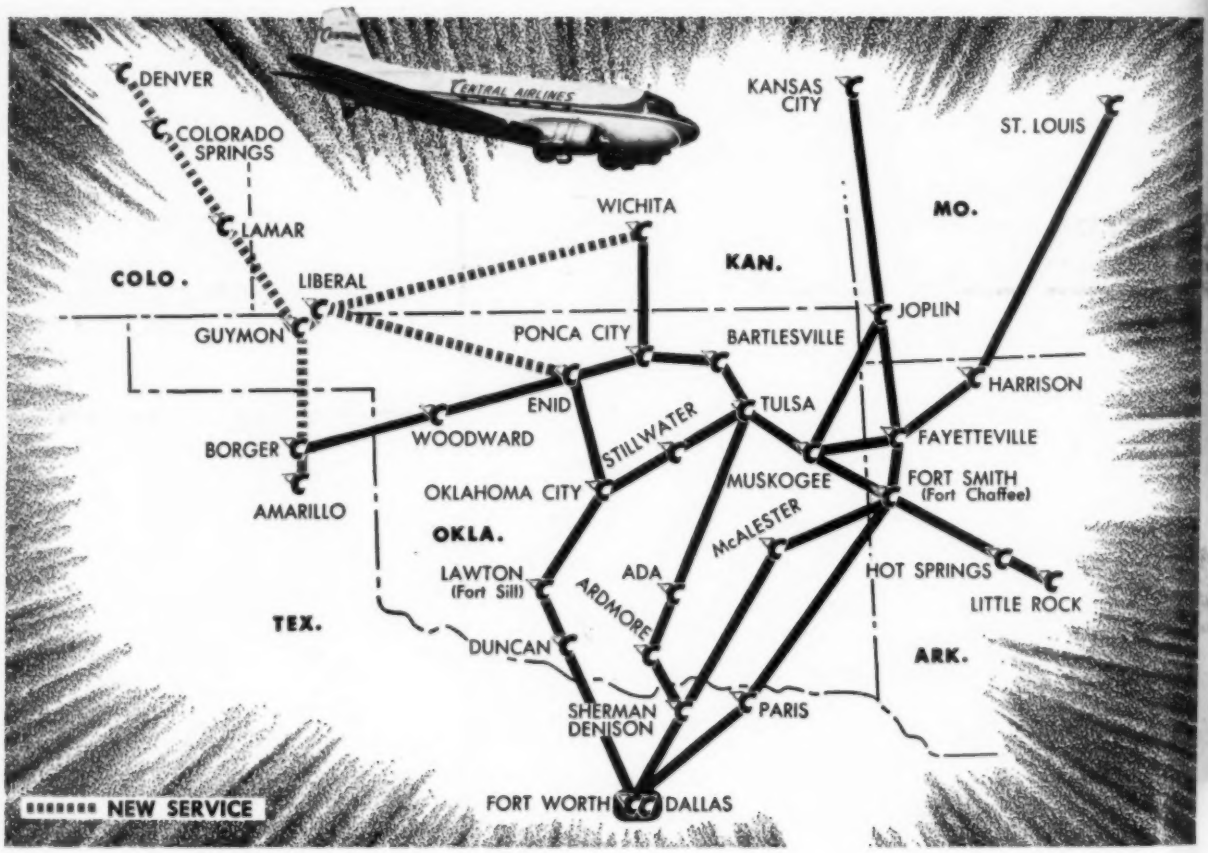

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